ATMOSPHERIC
OBSERVATIONS
U.S. ARCTIC STEAMER
JEANNETTE
1879-81.

Atmospheric observations
on board
U.S. Artic Steamer
Jeanette
1879 - 81.

Dr. James M.M. Ambler, U.S.N.

1879 Dr. Ambler

For ascertaining the amount of carbonic acid in the air the following apparatus is supplied:

1879. August

For ascertaining the amount of carbonic acid in the air the following apparatus is supplied:

Two glass jars, cubic capacity marked in cubic centimeters.

India-rubber stoppers, and sheet india rubber to tie over necks of jars.

Glass measure graduated to 60 c. c.

One Mohr's burette, 60 c. c., graduated into tenths.

Glass rods.

Glass bottle of one liter capacity.

Bottle containing papers of crystallized oxalic acid of 2.25 grammes each.

Bottle containing litmus or turmeric paper.

A small bellows, or, in its absence, a Davidson's syringe may be used.

Lime water and distilled water.

Directions: Pettenkofer's method is to be followed. For those not familiar with it the following process, extracted from Wilson's Hand-Book of Hygiene, is recommended:

The analysis depends on the relative alkalinity of lime water before and after it has absorbed the carbonic acid in the sample of air examined. 2.25 grammes of crystallized oxalic acid are dissolved in 1 liter of distilled water; 1 c. c. of this solution exactly neutralizes 1 milligramme of lime, and hence the amount of lime in a given quantity of lime water can be determined by adding the solution of oxalic acid until the point of neutralization is reached. The amount of oxalic acid required for neutralization expresses the alkalinity of the lime water. If the alkalinity of the lime water be known before and after it has absorbed the carbonic acid in the air contained in the glass jar, the difference will give the amount of lime in milligrammes which has united with the carbonic acid, and the amount of the latter is obtained by calculating according to the atomic weights.

The jar should be perfectly clean and dry. The air to be examined is forced into the jar by a pair of bellows, or a bellows-pump may be used. In either case the nozzle should reach the bottom of the jar.

After the jar has been filled, 60 c. c. of lime water are introduced, the mouth of the jar closed by the stopper, and the stopper secured by a tightly-fitting india-rubber cap. The jar is then well shaken so that the lime water is made to thoroughly wash the contained air, and afterward is left to stand at least eight hours and not more than twenty-four; 60 c. c. are introduced in order that 30 may be taken out for analysis.

Thirty cubic centimeters of lime are poured into the graduated glass and its alkalinity determined by the test solution. Then 30 c. c. are taken from the jar and the alkalinity also determined. The difference is doubled to account for the 30 c. c. left in the jar, and the product gives the amount of lime which has combined with the carbonic acid. The amount of the latter is obtained by converting weight into volume according to the atomic weights, and in one sum by the factor .39748+.

The following rule will simplify the calculation: Multiply the difference between the alkalinity of the lime water before and after it has been placed in the jar by 795 and divide this sum by the number of cubic centimeters in the jar, minus 60. The result will be the ratio of carbonic acid per 1,000 volumes.

A correction must be made for temperature as it is above or below the standard of 62° Fahrenheit. As the coefficient of expansion of air is .0020361 for every degree of Fahrenheit, the rule for correction may be stated with sufficient accuracy thus: For every 5° Fahrenheit above 62° add 1 per cent. to the amount of carbonic acid calculated as above, and deduct the same percentage for every 5° below 62°.

The formula for the correction for pressure is as follows:

30 : observed height of bar. : : capacity : z.

The result expressed by z is substituted for the actual capacity of the jar in the calculation for carbonic acid.

Atmospheric Observations on board U. S. S [illegible], for the month of August, 18[illegible].

Place.	Date.	Spar Deck 10 A. M. Barometer.	Attached Thermometer.	Dry bulb.	Wet bulb.	Relative humidity.	Spar Deck 4 P. M. Barometer.	Attached Thermometer.	Dry bulb.	Wet bulb.	Relative humidity.	Spar Deck 10 P. M. Barometer.	Attached Thermometer.	Dry bulb.	Wet bulb.	Relative humidity.	Berth Deck 10 A. M. Dry bulb.	Wet bulb.	Relative humidity.	Berth Deck 4 P. M. Dry bulb.	Wet bulb.	Relative humidity.	Berth Deck 10 P. M. Dry bulb.	Wet bulb.	Relative humidity.	Wind.	Weather.	Carbonic acid corrected for Temp. and Pressure, per 1,000 volumes.	Number of sick, excluding injuries.	Remarks.
Ounalashka	1	30.15	61	10	10	100	30.17	60	12	11	88	30.15	49	8	8	100	20	18	80	22	8	66	8	13	69	Calm	Foggy		0	Spar deck wet.
"	2	30.19	55	8	8	100	30.21	[illegible]	12	11	88	30.30	60	13	13	100	16	14	79	[illegible]	[illegible]	11	19	15	71	NNW	Foggy		0	"
"	3	30.21	60	13	11	77	30.27	62	11	10	87	30.23	53	12	12	100	22	17	58	19	6	72	19	16	68	Calm	Foggy		0	Spar deck dry. Berth deck [illegible]
"	4	30.26	66	22	18	66	30.26	70	22	18	66	30.23	68	21	18	73	25	20	61	27	[illegible]	51	24	19	60	SW	Clear		0	Dry.
"	5	30.08	66	18	15	71	29.83	67	15	14	89	29.90	69	10	9	86	23	19	60	25	[illegible]	62	16	12	59	W	Cloudy		0	Wet
At Sea	6	30.17	62	8	8	100	30.10	69	8	7	86	30.02	56½	7	7	100	16	[illegible]	79	18	8	68				W by N	Rain			Wet.
" "	7	29.80	59	7	7	100	29.72	65	8	7	86	29.78	48	8	8	100	19	15	63	12	0	76	14	13	99	ENE	Misty		1	Wet.
" "	8	29.50	50.5	8	8	100	29.41	48	7	6	85	29.37	44	6	6	100	18	16	71.	14	1	67	11	9	75	SW	Misty		1	Wet. Berth Deck Dry
" "	9	29.53	47.3	6.5	6.5	100	29.63	49	6	6	100	29.68	44	6	6	100	16	12	59	16	3	69				NNW	O.C		0	Wet. " " "
" "	10	29.73	43	5.5	5.6	100	29.74	44.2	6	6	100	29.73	43	6	6	100	13	11	77	17	6	90				NW/N	O.C.		0	Wet. " " "
" "	11	29.78	43	6	6	100	29.73	50	9	9	100	29.76	43	8	8	100	19	18	90	21	8	73	15	13	78	NW/N	O.C		0.	Wet. " " "
St Michaels	12	29.75	58	12	10	76	29.75	52.5	11.5	10.5	100	29.75	52	11	10	87	18	16	80				14	11	67	N	Clear		1	Wet. " " "
" "	13	29.82	52	10	10	100	29.83	56	12	11	88	29.85	54	11	11	100	17	13	61	14	5	63	17	11	48	NNE	O.C		2	Wet. " " "
" "	14	29.42	63.5	14	12	78	29.78	56.7	12	11	88	29.73	56.5	11	10	87	22	17	58	19	18	72	19	17	81	NNE	b.c.		2	Wet " " "
" "	15	29.61	56	13	11	77	29.52	54	11	9	75	29.45	51	10	9	86	19	17	81	13	5	80	15	12	68	N	O.C		2	Wet. " " "
" "	16	29.31	51.5	10	9	86						29.42	41	10	9	86	18	15	71.							S/E	O.C		2	" " " "
" "	17	29.52	56	14	11	67	29.63	56.8	12	10	76	29.68	52	11	10	87	20	17	74	21	15	29	14	12	28	Calm	O.C		1	" " " "
" "	18	29.85	51	10	9	86	29.93	53.5	10	9	86	29.96	52	10	8	74	17	11	43	22	7	58	13	9	55	NW	Clear		1	Dry. " " "
" "	19	30.04	51	9	7	73	30.07	57	11	8	63	30.09	51	11	8	68	13	11	77	17	11	42	14	10	57	NNE	O.C		0	" " " "
" "	20	30.21	50	10	8	74	30.25	51	9	8	86	30.30	51.5	10	8	74	18	13	53	18	13	53	13	10	66	NW	b.c.		0	" " " "
"	21	30.35	57.5	13	11	77	30.33	57	16	12	59	30.36	54	12	11	88.	17	14	70	21	15	49	14	12	78	Calm	b.c		0	" " " "
At Sea	22	30.18	55	12	10	76	30.10	57	12	9	65	30.01	50	9	8	86	19	13	26	14	11	67	14	11	67	"	b.c			Spar deck wet from taking in water [illegible]
" "	23	30.03	43	5	4	84	30.08	40	4	3	83	30.11	38	3	2	83	14	13								NW	b.c		0	" " " " " " "
" "	24	30.12	39	3	2	83	30.12	38.5	3	2	83	30.12	38	4	3	83	13	11	77	14	13	89	14	13	89	"	O.C.		0	" " " " " " "
St Lawrence Bay	25	30.18	47	6	5	85	30.15	49	8	5	59	30.14	43	4	3	83	19	13	46				9	6	61	N	Clear		0	Wet.
" "	26	30.09	43½	5	4	84	30.06	49½	9	6	61	30.05	45	6	5	85	11	8	63	12	9	66	12	9	66	Calm	Clear		1	Wet.
At Sea	27	30.01	52	11	8	63	30.03	64	9	7	78	30.02	42	4	3	83	15	13	78				14	10	57	N	Clear		1	Wet.
" "	28	30.01	42	4	3	83	30.00	37	2	2	100	29.99	36.5	2	1	82	7	5	71				10	6	30	N/E	b.c		1	Wet. Berth deck wet - shipped a sea
" "	29	29.94	37	2	2	100	29.93	35.8	1.4	1.2	100(?)	29.93	37	1.5	1	100(?)	11	8	63	12	10	76				NW/N	O.C.		2.	" " " "
" "	30	29.89	37.5	2.5	2	100	29.91	38.5	3.2	3	100	29.97	37	2	1.5	82	12	8	54	17	15	80	14	[illegible]	67	W/N	O.C		2	" . Berth deck Dry
	31	30.11	38.5	2	1	82	30.17	37.2	3	2	83	30.24	38	1	.5		11	9	65	15	11	68	11	8	68	N	O.C		2	" " " "
Average																														

Carbonic acid column (written vertically): No observations for carbonic acid, as the weather would not permit [illegible]

Observations for carbonic acid should be made at least once a week, and the air of the berth deck at night or early in the morning should be selected. The results will not be entered unless the observer is certain of their accuracy.
The time and circumstances of observations for carbonic acid and the wetting of the decks *from any cause* will be entered in column of Remarks.
Same instruments to be used in all hygrometric observations.

Surgeon, U. S. N.

Sept 1879. 2

For ascertaining the amount of carbonic acid in the air the following apparatus is supplied:

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India-rubber stoppers, and sheet india rubber to tie over necks of jars.

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30 : observed height of bar. : : capacity : z.

The result expressed by z is substituted for the actual capacity of the jar in the calculation for carbonic acid.

Atmospheric Observations on board U. S. Arctic Str. Jeannette, for the month of September, 1879.

PLACE.	DATE.	SPAR DECK 10 A. M. Barometer.	Attached Thermometer.	Dry bulb.	Wet bulb.	Relative humidity.	4 P. M. Barometer.	Attached Thermometer.	Dry bulb.	Wet bulb.	Relative humidity.	10 P. M. Barometer.	Attached Thermometer.	Dry bulb.	Wet bulb.	Relative humidity.	BERTH DECK 10 A. M. Dry bulb.	Wet bulb.	Relative humidity.	4 P. M. Relative humidity.	10 P. M. Dry bulb.	Wet bulb.	Relative humidity.	WIND.	WEATHER.	Carbonic acid corrected for Temp. and Pressure, per 1,000 volumes.	Number of sick, excluding injuries.	REMARKS.
At sea	1	30.17	37.5	1.5	1	91	30.15	34	0.8	0.5	95	30.11	33	0.2	-.5	87	12	10	57	67	12	9	47	NW/N	OC		2	Spar deck wet. Berth deck dry.
69.10 N. - 176.6 W.	2	30.00	39	1	0	81	29.97	39.4	3.6	2.5	.815	29.97	37	2	1.5	91	15	18	48	45	14	10	57	SE/E	Clear		1	Spar deck wet. " " "
70.33 N. - 174.35 W.	3	30.08	32.5	-1	-1	100	30.09	31	-2.5	-3	89	30.14	33.2	-2	-2	100	12	10	76	83	14	12½	83	SE	Thick fog		1	" " " " " "
At sea	4	30.15	36.5	-0.56	-0.83		30.09	36.5	0.28	0	[illegible]	30.09	32	0	-0.56		14	13	89	80	11.5	11	96	Clear	"		1	" " " " " "
Off Herald Island	5	30.05	32	-1.11	-.56		30.03	37.5	-1.4	-1.7		30.03	36	-4	-4.17		13.5	12	83	70	15	13	78	N	OC		1	" " " " " "
" "	6	30.03	31	-2.78	-1.94		30.06	33	0.56	0.56		30.07	29.8	-3.33	-2.78		16½	14	74	74	16	14½	88.5	N	fog		1	Ice on spar deck. " " "
" "	7	30.14	30.5	-2.78	-2.78		30.21	50.5	-2.50	-2.78		30.19	24.5	-6.67	-6.67		15	12.5	94	85	17	13	61	N/E	OC		1	" " " " " " "
" "	8	30.17	31.5	-3.89	-3.89		30.15	36	-2.50	-2.50		30.14	29.5	-3.89	-3.89		15	12	58	100	18	16	80	NNE	BC		1	" " " "
" "	9	30.11	32	-3.89	-3.89		30.17	58	-3.33	-3.61		30.04	24	-6.11	-6.11		16	18	69	58	17.5	14	66	NE	BC		1	" " " "
" "	10	30.00	26	-5.56	-5.56		29.95	29	-4.17	-4.33		29.90	27.5	-3.89	-3.89		14	11.5	72.5	78	15	12	68	NE	OF		1	" " " "
" "	11	29.84	39.5	-0.56	-0.83		29.83	40	0.00	-0.28		29.82	33	-0.56	-0.56		15.5	13	74	52	15.5	13	74	E	OF		1	" " " "
" "	12	29.84	33.5	-2.22	-2.50		29.83	33.5	-1.11	-1.56		29.80	29.5	-3.89	-3.84		15	12.5	72	78	14	12	78	S	FC		0	" " " "
" "	13	29.79	37	0.00	-0.39		29.83	33.5	-0.56	-0.83		29.83	34	-1.89	-1.89		14	13	89	75	14.5	12.5	78		fog		0	" " " "
" "	14	29.84	36	-0.83	-1.11		29.7[illegible]	34	-0.83	-1.00		29.70	32	-2.22	-2.22		14	12	78	74	18	15.5	70.5	SE	OC		0	" " " "
" "	15	29.66	29.5	-1.67	-1.94		29.63	33	-0.56	-0.67		29.67	30	-2.22	-2.22		13	10	64	76	15	12.5	73	SE	OC		0	" " " "
" "	16	29.76	28	-3.61	-3.89		29.80	30.6	-1.50	-1.83		29.83	30	-1.67	-1.67		11.2	9	74	71	17	14	70	SSE	BC		0	" " " "
" "	17	29.95	30	-3.33	-3.61		30.00	55	-0.83	-1.11		29.95	34	-0.28	-1.11		14	12	78	67	15	13	78	calm	BC		0	" " " "
At sea in Pack	18	29.96	36	-4.44	-4.44		29.76	36	1.67	1.28		29.73	35	1.11	1.00		18	15	71	85	17	15	80	E/N	OC	.23 2[illegible] met	0	Wet from melting
" " "	19	29.67	36	1.67	1.39		29.66	38	1.67	1.56		29.65	34	0.56	0.56		19	16	72	85.5	17	14.5	75	E/S	OC	3.8 / 2.3246 cm	0	" " . air taken at 10 pm, at the height of lower berths, level of sleepers head –
" " "	20	29.61	37	2.11	1.94		29.67	34.8	0.72	0.72		29.84	31.5	-1.11	-1.12		15.5	13.5	77	78	11	9	75	E	OC		0	" " "
" " "	21	29.98	34	-0.94	-0.56		30.05	33	0.00	0.00		30.09	31	-1.67	-1.67		10	8	74	73	14	11.5	72.5	S/E	BC		0	Ice on deck.
" " "	22	30.17	27	-3.61	-3.89		30.18	30.2	-2.56	-2.94		30.17	22	-5.94	-6.11		12	9.5	71	75	11	9	75	SSW	BC			" " "
" " "	23	29.18	36.5	-4.44	-4.44		30.10	26.2	-4.44	-5.00		30.12	24.5	-6.11	-6.11		7	5.5	78	[illegible]5	16	13	69	SW	O.C. snow	38 cm / 1.8012	0	" " "
" " "	24	30.09	22	-6.67	-6.67		30.07	24.6	-5.22	-5.56		30.06	23	-6.11	-6.11		11	9	75	[illegible]6	12.5	10	71	SSW	BC		0	Snow on deck.
" " "	25	29.86	22.5	-5.56	-5.83		29.755	17	-8.33	-8.33		* 29.46	54 (32°)	-8.33	-8.33		11	8.5	69	[illegible]7	13	11	77	calm	snow		0	" " " air taken at 11 PM, 4 persons below,
" " "	26	29.25	54	-7.50	-7.78		29.385	53	-11.94	-11.94		29.42	54 (32°)	-11.11	-11.11		9	6.5	67	[illegible]0	9.5	7	67.5	S/W	BC	W R cm 1.736	0	" " " in the ward room –
" " "	27	29.41	48.5	-12.22	-12.22		29.42	44	-12.22	-12.22		29.40	40 (32°)	-11.94	-11.94		5	3	69	[illegible]2	9.3	7.3	77	W/S	OC		0	" " "
	28	29.40	38	-11.11	-11.11		29.46	54	-9.44	-9.44		29.51	38 (32°)	-11.11	-11.11		8.5	5.5	59.7	72	8	6	72	calm	OC		0	Snowing.
" " "	29	29.66	50	-10.94	-10.94		29.70	52	-11.39	-11.39		29.68	56 (32°)	-13.33	-13.13		10	8	74	85	10	7.5	68	NE/E	OC		0	Snow on deck
	30	29.70	50	-10.28	-10.00		29.67	57	-10.56	-10.00		29.65	50 (32°)	-12.22	-12.22		9	6.5	67	[illegible].5	11	9	75	NE/E	BC		0	Snow on deck
	31																											
AVERAGE		29.86	38.4	-2.1			29.87	41.2	-2.9			29.86	30.6	-4.1			12.8	10.4	72.4	[illegible]	13.9	11.6	73.1	[illegible]	OC 14 / BC 14 / 32	2.6206	0	Spar deck wet. B dry

Observations for carbonic acid should be made at least once a week, and the air of the berth deck at night or early in the morning should be selected. The results will not be entered unless the observer is certain of their accuracy.
The time and circumstances of observations for carbonic acid and the wetting of the decks *from any cause* will be entered in the column of Remarks.
Same instruments to be used in all hygrometric observations.

* 10 PM of the 25. Aneroid removed into the cabin & corrected by mercurial standard to 32 degrees F.

Surgeon, U. S. N.

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Lime water and distilled water.

Directions: Pettenkofer's method is to be followed. For those not familiar with it the following process, extracted from Wilson's Hand-Book of Hygiene, is recommended:

The analysis depends on the relative alkalinity of lime water before and after it has absorbed the carbonic acid in the sample of air examined. 2.25 grammes of crystallized oxalic acid are dissolved in 1 liter of distilled water; 1 c. c. of this solution exactly neutralizes 1 milligramme of lime, and hence the amount of lime in a given quantity of lime water can be determined by adding the solution of oxalic acid until the point of neutralization is reached. The amount of oxalic acid required for neutralization expresses the alkalinity of the lime water. If the alkalinity of the lime water be known before and after it has absorbed the carbonic acid in the air contained in the glass jar, the difference will give the amount of lime in milligrammes which has united with the carbonic acid, and the amount of the latter is obtained by calculating according to the atomic weights.

The jar should be perfectly clean and dry. The air to be examined is forced into the jar by a pair of bellows, or a bellows-pump may be used. In either case the nozzle should reach the bottom of the jar.

After the jar has been filled, 60 c. c. of lime water are introduced, the mouth of the jar closed by the stopper, and the stopper secured by a tightly-fitting india-rubber cap. The jar is then well shaken so that the lime water is made to thoroughly wash the contained air, and afterward is left to stand at least eight hours and not more than twenty-four; 60 c. c. are introduced in order that 30 may be taken out for analysis.

Thirty cubic centimeters of lime are poured into the graduated glass and its alkalinity determined by the test solution. Then 30 c. c. are taken from the jar and the alkalinity also determined. The difference is doubled to account for the 30 c. c. left in the jar, and the product gives the amount of lime which has combined with the carbonic acid. The amount of the latter is obtained by converting weight into volume according to the atomic weights, and in one sum by the factor .39748+.

The following rule will simplify the calculation: Multiply the difference between the alkalinity of the lime water before and after it has been placed in the jar by 795 and divide this sum by the number of cubic centimeters in the jar, minus 60. The result will be the ratio of carbonic acid per 1,000 volumes.

A correction must be made for temperature as it is above or below the standard of 62° Fahrenheit. As the coefficient of expansion of air is .0020361 for every degree of Fahrenheit, the rule for correction may be stated with sufficient accuracy thus: For every 5° Fahrenheit above 62° add 1 per cent. to the amount of carbonic acid calculated as above, and deduct the same percentage for every 5° below 62°.

The formula for the correction for pressure is as follows:

30 : observed height of bar. : : capacity : z.

The result expressed by z is substituted for the actual capacity of the jar in the calculation for carbonic acid.

Atmospheric Observations on board U. S. S. Arctic Str. Jeannette, for the month of October, 1879.

Place.	Date.	Spar Deck 10 A.M. Barometer.	Attached Thermometer.	Dry bulb.	Wet bulb.	Relative humidity.	4 P.M. Barometer.	Attached Thermometer.	Dry bulb.	Wet bulb.	Relative humidity.	10 P.M. Barometer.	Attached Thermometer.	Dry bulb.	Wet bulb.	Relative humidity.	Berth Deck 10 A.M. Dry bulb.	Wet bulb.	Relative humidity.	4 P.M. Relative humidity.	10 P.M. Dry bulb.	Wet bulb.	Relative humidity.	Wind.	Weather.	Carbonic acid corrected for Temp. and Pressure, per 1,000 volumes.	Number of sick, excluding injuries.	Remarks.
Bent in Pack	1	29.56		-7.78	-7.78		29.51		-9.44	9.44		29.65		-10.00	-10.00		13	8.5	50	57	14	10	57	E/N	hazy		0	Snow on Deck.
" " "	2	29.44		-7.22	-7.22		29.49		-1.39	-1.39		29.61		-3.33	-3.33		9	6	61	67	12	11	88	NEN	bc		0	" " "
" " "	3	29.77		-5.00	-5.00		29.85		-4.44	-4.44		29.91		-6.11	-6.11		8	5.5	65.5	74	12½	10½	76.5	NE/E	oc		0	Ice on Deck.
" " "	4	29.90		-5.00	-5.11		29.92		-5.56	-5.56		29.94		-6.11	-6.11		11	8.5	69	71.5	14	12	78	ENE	oc		0	" " "
" " "	5	29.95		-8.33	-8.33		29.94		-9.33	-9.33		29.94		-10.00	-10.00		11	9	78	75	12	10	74	NWN	oc		0	" " "
" " "	6	29.86		-8.06	-8.04		29.75		-12.33	-12.33		29.40		-13.33	-13.33		12	10	76	75	15	10	48	SE	Snowing		0	Snow on Deck
" " "	7	29.13		-5.56	-5.56		29.115		-5.83	-5.83		29.10		-3.33	-3.33		14	11	67	65.5	14.5	12	73	SE	oc		0	" " "
" " "	8	29.15		-2.78	-2.78		29.12		0.00	0.00		29.12		-0.56	-0.56		14	11	67	63	~~75~~	12½	73	E/N	Snowing	10½ P.M. 1.1665	0	" " "
" " "	9	29.00		-0.56	-0.56		29.18		-10.56	-10.56		29.42		-12.22	-12.22		16.8	13.5	67.5	65	14 (corr. 18)	12	70	ESE	"		0	" " "
" " "	10	29.65		-10.83	-10.83		29.44		-3.06	-3.06		29.32		-1.67	-1.67		11	9	65	69	16	13.5	74	ESE	oc		0	" " "
" " "	11	28.79		-0.00	-0.00		28.73		-0.56	-0.56		28.72		-1.11	-1.11		~~14~~	~~12.5~~	72.5	67.5	17.5	15	75	E	oc		0	Deck wet from melted snow
" " "	12	28.87		-1.67	-1.67		28.88		-5.00	-5.00		29.18		-6.67	-6.67		16.5	14	74	78	14	12	78	W/S	Snowing		0	Snow on Deck
" " "	13	29.27		-10.00	-10.00		29.385		-11.11	-11.11		29.47		-11.67	-11.67		[illegible]	15.5	67.5	70	15	13	78	W	S		0	" " "
" " "	14	29.62		-9.44	-9.44		29.73		-10.83	-10.83		29.75		-11.36	-11.36		12	9.6	70.5	67	15	12	68	W/N	S		0	" " "
" " "	15	29.77		-8.06	-8.06		29.82		-8.06	-8.06		29.86		-8.33	-8.33		13	10	66	63	14	12	78	WSW	S		0	" " "
" " "	16	29.83		-6.94	-6.94		29.83		-8.06	-8.06		29.83		-7.78	-7.78		13	11	77	73	15	12.5	73	ESE	S		0	" " "
" " "	17	29.75		-5.28	-5.28		29.68		-7.50	-7.50		29.61		-5.56	-5.56		15	12	68	72	14	11.5	72.5	E/S	oc		0	" " "
" " "	18	~~29.55~~		-3.06	-3.06		29.67		-5.83	-5.83		29.65		-6.67	-6.67		14	12	78	67.5	15	13.5	83.5	NNW	oc	Spar Deck .4178 corrected	0	" " " Carbonic dioxide Taken at 8½ P.M.
" " "	19	29.79		-8.33	-8.33		29.85		-8.61	-8.61		29.93		-8.61	-8.61		13	11	78	73	16 (corr. 15)	19 (corr. 13)	78	NW	oc		0	" " "
" " "	20	29.76		-8.89	-8.89		29.95		-15.00	-15.00		30.00		-15.00	-15.00		~~14.5~~ 12.5	~~12.5~~ 11.5	88	72	16.5	14.5	78	NW	oc		0	" " "
" " "	21	30.00		-15.83	-15.83		29.97		-22.50	-22.50		29.96		-21.11	-21.11		12	9.5	70.5	73.5	11	8.5	69	W	oc		0	" " "
" " "	22	29.89		-16.67	-16.67		29.93		-18.89	-18.89		29.92		-20.28	-20.28		9	6.8	67	71	~~10.5~~	9	83	NW	oc		0	" " "
" " "	23	29.91		-22.22	-22.22		29.87		-22.78	-22.78		29.91		-22.22	-22.22		8	6	72	70	13	11	77	WNW	oc	1.8136 corrected	0	" " "
" " "	24	29.90		-21.67	-21.67		29.915		-21.94	-21.94		29.97		-20.56	-20.56		10	8	74	67	9	7.5	79.5	WNW	bc	13 D 1.7858	0	" " " Air taken at 10 P.M.
" " "	25	30.01		-21.67	-21.67		30.005		-20.28	-20.28		30.08		-22.78	-22.78		12	9.5	70.5	67	10.8	9	77	NNW	oc		0	" " "
" " "	26	30.10		-26.11	-26.11		30.08		-27.22	-27.22		30.122		-25.00	-25.00		9	8.5	91	64	10.6	8.8	76	WNW	bc		0	" " "
" " "	27	30.11		-25.00	-25.00		30.08		-20.28	-20.28		30.07		-21.11	-21.11		9	6½	67	82	13	10.5	71.5	NW/W	bc		0	" " "
" " "	28	30.02		-22.78	-22.78		29.965		-23.61	-23.61		29.93		-22.22	-22.22		9	7	73	76	9	7	73	calm	bc		0	" " "
" " "	29	29.80		-19.44	-19.44		29.76		-17.78	-17.78		29.75		-17.22	-17.22		9	7	73	75	11	8	63	SSE	bc		0	" " "
" " "	30	29.70		-8.33	-8.33		29.61		-5.28	-5.28		29.65		-7.22	-7.22		11	8½	71.5	72.5	17	14	68	NE/E	oc		0	" " "
" " "	31	29.62		-14.17	-14.17		29.54		-13.61	-13.61		29.52		-8.33	-8.33		9	7	73	82	16.5	14	74	W	oc		0	
Average		29.46	32°	-11.1			29.45	32°	-11.4			29.68	32°	-11.5			11.8	9.5	71	72.3	14.3	11.6	[illegible]7	Northerly	oc	1.47	0	dry

Observations for carbonic acid should be made at least once a week, and the air of the berth deck at night or early … ing should be selected. The results will not be entered unless the observer is certain of their accuracy.
The time and circumstances of observations for carbonic acid and the wetting of the decks *from any cause* will be … column of Remarks.
Same instruments to be used in all hygrometric observations.

Barometer corrected to 32° (degrees) Farenheit.

Surgeon, U. S. N.

For ascertaining the amount of carbonic acid in the air the following apparatus is supplied:

Two glass jars, cubic capacity marked in cubic centimeters.

India-rubber stoppers, and sheet india rubber to tie over necks of jars.

Glass measure graduated to 60 c. c.

One Mohr's burette, 60 c. c., graduated into tenths.

Glass rods.

Glass bottle of one liter capacity.

Bottle containing papers of crystallized oxalic acid of 2.25 grammes each.

Bottle containing litmus or turmeric paper.

A small bellows, or, in its absence, a Davidson's syringe may be used.

Lime water and distilled water.

Directions: Pettenkofer's method is to be followed. For those not familiar with it the following process, extracted from Wilson's Hand-Book of Hygiene, is recommended:

The analysis depends on the relative alkalinity of lime water before and after it has absorbed the carbonic acid in the sample of air examined. 2.25 grammes of crystallized oxalic acid are dissolved in 1 liter of distilled water; 1 c. c. of this solution exactly neutralizes 1 milligramme of lime, and hence the amount of lime in a given quantity of lime water can be determined by adding the solution of oxalic acid until the point of neutralization is reached. The amount of oxalic acid required for neutralization expresses the alkalinity of the lime water. If the alkalinity of the lime water be known before and after it has absorbed the carbonic acid in the air contained in the glass jar, the difference will give the amount of lime in milligrammes which has united with the carbonic acid, and the amount of the latter is obtained by calculating according to the atomic weights.

The jar should be perfectly clean and dry. The air to be examined is forced into the jar by a pair of bellows, or a bellows-pump may be used. In either case the nozzle should reach the bottom of the jar.

After the jar has been filled, 60 c. c. of lime water are introduced, the mouth of the jar closed by the stopper, and the stopper secured by a tightly-fitting india-rubber cap. The jar is then well shaken so that the lime water is made to thoroughly wash the contained air, and afterward is left to stand at least eight hours and not more than twenty-four; 60 c. c. are introduced in order that 30 may be taken out for analysis.

Thirty cubic centimeters of lime are poured into the graduated glass and its alkalinity determined by the test solution. Then 30 c. c. are taken from the jar and the alkalinity also determined. The difference is doubled to account for the 30 c. c. left in the jar, and the product gives the amount of lime which has combined with the carbonic acid. The amount of the latter is obtained by converting weight into volume according to the atomic weights, and in one sum by the factor .39748+.

The following rule will simplify the calculation: Multiply the difference between the alkalinity of the lime water before and after it has been placed in the jar by 795 and divide this sum by the number of cubic centimeters in the jar, minus 60. The result will be the ratio of carbonic acid per 1,000 volumes.

A correction must be made for temperature as it is above or below the standard of 62° Fahrenheit. As the coefficient of expansion of air is .0020361 for every degree of Fahrenheit, the rule for correction may be stated with sufficient accuracy thus: For every 5° Fahrenheit above 62° add 1 per cent. to the amount of carbonic acid calculated as above, and deduct the same percentage for every 5° below 62°.

The formula for the correction for pressure is as follows:

30 : observed height of bar. : : capacity : z.

The result expressed by z is substituted for the actual capacity of the jar in the calculation for carbonic acid.

Atmospheric Observations on board U. S. S ________, for the month of *November*, 187*4*.

Place	Date	Spar deck 10 A.M. Barometer.+	Attached Thermometer.	Dry bulb.	Wet bulb.	Relative humidity.	4 P.M. Barometer.	Attached Thermometer. (Dry)	Dry bulb. (wet)	Wet bulb.	Relative humidity.	10 P.M. Barometer.	Attached Thermometer.	Dry bulb.	Wet bulb.	Relative humidity.	Berth deck 10 A.M. Dry bulb.	Wet bulb.	Relative humidity.	4 P.M. Relative humidity.	10 P.M. Dry bulb.	Wet bulb.	Relative humidity.	Wind.	Weather.	Carbonic acid corrected for Temp. and Pressure, per 1,000 volumes.	Number of sick, excluding injuries.	Remarks.
In the Pack	1	29.47		-12.22	-12.22		29.45	-13.61				29.54		-15.28	-15.28		16.5	13.8	72	79	14	13	89	NW/N	Snow		0	Snow on spar deck
" " "	2	29.54		-16.67	-16.67		29.535	-15.00	-15.00			29.55		-14.44	-14.44		13	11	67	58	15	13	78	NNW	oc		0	" " "
" " "	3	29.44		-16.11	-16.11		29.42	-14.72	-14.72			29.41		-16.39	-16.39		13	11	67	68	18	15	71	NNW	oc	B.D.	0	" " "
" " "	4	29.41		-16.67	-16.67		29.38	-16.67	-16.67			29.40		-16.39	-16.39		11.5	9	70	62.5	18	15	71	N/E	oc	2.3430	0	" " " CO_2 taken at 11 P.M.
" " "	5	29.38		-16.11	-16.11		29.38	-16.11	-16.11			29.45		-17.50	-17.50		14	12	78	67	17.5	14.5	70.5	N.W	oc		0	" " "
" " "	6	29.44		-23.06	-23.06		29.455	-17.78	-17.78			29.56		-17.22	-17.22		11	9	77	77	18	11	77	SSW	bc		0	" " "
" " "	7	29.74		-20.88			29.685	-21.11				29.77		-19.44			16	18	69	79	17	14	70	Clm	bc		0	" " "
" " "	8	29.77		-18.61			29.74	-20.00				29.78		-20.00			17.5	14.5	70	67.5	16	14	79	Clm	oc		0	" " "
" " "	9	29.71		-20.56			29.66	-20.00				29.73		-16.94			14.5	12.5	78	78	17.5	14.5	68.5	E/N	oc		0	" " "
" " "	10	29.76		-18.89			29.885	-25.28				29.95		-27.50			16	14	79	88	20	16.5	64.5	SW/S	oc		0	Deck under deck house dry.
" " "	11	30.10		-25.06			29.96	-23.61				29.96		-17.50			17	14	70	74	16	14	79	Clm	oc		0	" " " " "
" " "	12	29.85		-31.11			29.752	-27.22				29.74		-23.89			13.5	11	57.5	68	12	10	76	S	bc		0	Dry on Deck.
" " "	13	29.72		-24.44			29.77	-23.89				29.88		-23.89			12.5	10	71	78	15.5	13	74	SW/S	oc		0	" " "
" " "	14	29.74		-20.56			29.775	-22.23				29.89		-24.44			13	10.5	71.5	82	16	13.5	74	Clm	bc		0	" " "
" " "	15	30.24		-22.78			30.28	-21.39				30.24		-20.56			13	10.5	71.5	79	14.5	13	83	WNW	bc		0	" " "
" " "	16	29.82		-15.56			29.62	-11.83				29.54		-8.33			15.5	13	74	78	15	12.5	73	SE/E	oc		0	" " "
" " "	17	29.32		-5.2			29.375	-6.28				29.56		-11.39			15.5	13.5	80	86	17	15	80	SE/E	oc		0	Wet on Spar deck.
" " "	18	29.64		-14.44			29.715	-17.50				29.76		-20.56			18	11	77	74	18	15	71	N.N.W	oc		0	Ice & snow on Deck
" " "	19	29.69		-21.67			29.645	-21.11				29.63		-20.56			17	14.5	75	63	14	11	67	NE/N	oc		0	" " " " "
" " "	20	29.52		-16.67			29.45	-13.89				29.53		-11.39			13	11	77	76	16.5	14	74	NE/E	oc		0	" " " " "
" " "	21	29.62		-21.11			29.66	-23.33				29.71		-26.67			15.5	13	74	76	15.5	12	63	NE/E	oc		0	" " " " "
" " "	22	29.41		-23.33			29.15	-18.89				28.92		-13.33			16	13	69	69	16	13½	74	NE	oc		0	" " " " "
" " "	23	28.84		~~-20.56~~ -5.00			28.84	~~-20.72~~ -5.83				28.92		-10.00			16.5	13.5	71.5	79	17.5	14.5	70.5	ESE	oc		0	" " "
" " "	24	29.21		-19.44			29.44	-20.00				29.63		-20.56			14.5	11	6[illegible]	72	11	9.5	81	SW/W	oc		0	" " " " "
" " "	25	29.91		-22.22			30.10	-23.89				30.30		-18.33			10	8	74	78	12.5	11	81	SW/W	oc		0	" " " " "
" " "	26	30.34		-17.22			30.32	-13.44				30.30		-12.22			15	14	89	73	12	10.5	82	E.O.E	oc		0	" " " " "
" " "	27	30.11		-11.11			30.00	-10.28				30.05		-10.56			13	11	77	74	15	13	78	S.O.E	oc		0	" " " " "
" " "	28	30.02		-10.00			30.22	-9.44				30.32		-10.00			17	15	80	83	20	17	72	SE/E	oc	1.079	0	" " " " " CO_2 11 P.M. Berth deck 1.079
" " "	29	30.23		-11.11			30.28	-11.61				30.29		-11.11			13	12.5	94	94.5	16	15.5	94.5	E	oc		0	For last two days have been distilling in deck house
" " "	30	30.28		-12.22			30.29	-13.89				30.30		-15.56			17	14	7[illegible]	70	13	11.5	~~85.5~~	SE/E	oc		0	
	31																											
AVERAGE		29.70		-19.9			29.73	-17.2				29.75		-17.2			14.4	12.1	73	74.7	15.6	13.3	75.6	Northerly	oc	1.711	0	dry

Observations for carbonic acid should be made at least once a week, and the air of the berth deck at night or early [morning] should be selected. The results will not be entered unless the observer is certain of their accuracy. The time and circumstances of observations for carbonic acid and the wetting of the decks *from any cause* will be [entered in the col]umn of Remarks. Same instruments to be used in all hygrometric observations.

+ Barometer corrected to 32° F. Owing to the low temperatures the wet bulb readings on deck are worthless & have simply been [illegible] & set down as a matter of routine — will [illegible] them from this time as they are [illegible]

Surgeon, U. S. N.

For ascertaining the amount of carbonic acid in the air the following apparatus is supplied:

Two glass jars, cubic capacity marked in cubic centimeters.

India-rubber stoppers, and sheet india rubber to tie over necks of jars.

Glass measure graduated to 60 c. c.

One Mohr's burette, 60 c. c., graduated into tenths.

Glass rods.

Glass bottle of one liter capacity.

Bottle containing papers of crystallized oxalic acid of 2.25 grammes each.

Bottle containing litmus or turmeric paper.

A small bellows, or, in its absence, a Davidson's syringe may be used.

Lime water and distilled water.

Directions: Pettenkofer's method is to be followed. For those not familiar with it the following process, extracted from Wilson's Hand-Book of Hygiene, is recommended:

The analysis depends on the relative alkalinity of lime water before and after it has absorbed the carbonic acid in the sample of air examined. 2.25 grammes of crystallized oxalic acid are dissolved in 1 liter of distilled water; 1 c. c. of this solution exactly neutralizes 1 milligramme of lime, and hence the amount of lime in a given quantity of lime water can be determined by adding the solution of oxalic acid until the point of neutralization is reached. The amount of oxalic acid required for neutralization expresses the alkalinity of the lime water. If the alkalinity of the lime water be known before and after it has absorbed the carbonic acid in the air contained in the glass jar, the difference will give the amount of lime in milligrammes which has united with the carbonic acid, and the amount of the latter is obtained by calculating according to the atomic weights.

The jar should be perfectly clean and dry. The air to be examined is forced into the jar by a pair of bellows, or a bellows-pump may be used. In either case the nozzle should reach the bottom of the jar.

After the jar has been filled, 60 c. c. of lime water are introduced, the mouth of the jar closed by the stopper, and the stopper secured by a tightly-fitting india-rubber cap. The jar is then well shaken so that the lime water is made to thoroughly wash the contained air, and afterward is left to stand at least eight hours and not more than twenty-four; 60 c. c. are introduced in order that 30 may be taken out for analysis.

Thirty cubic centimeters of lime are poured into the graduated glass and its alkalinity determined by the test solution. Then 30 c. c. are taken from the jar and the alkalinity also determined. The difference is doubled to account for the 30 c. c. left in the jar, and the product gives the amount of lime which has combined with the carbonic acid. The amount of the latter is obtained by converting weight into volume according to the atomic weights, and in one sum by the factor .39748+.

The following rule will simplify the calculation: Multiply the difference between the alkalinity of the lime water before and after it has been placed in the jar by 795 and divide this sum by the number of cubic centimeters in the jar, minus 60. The result will be the ratio of carbonic acid per 1,000 volumes.

A correction must be made for temperature as it is above or below the standard of 62° Fahrenheit. As the coefficient of expansion of air is .0020361 for every degree of Fahrenheit, the rule for correction may be stated with sufficient accuracy thus: For every 5° Fahrenheit above 62° add 1 per cent. to the amount of carbonic acid calculated as above, and deduct the same percentage for every 5° below 62°.

The formula for the correction for pressure is as follows:

30 : observed height of bar. : : capacity : z.

The result expressed by z is substituted for the actual capacity of the jar in the calculation for carbonic acid.

Atmospheric Observations on board U. S. S. Arctic Str [illegible]unitte, for the month of December, 1874.

	DATE.	SPAR DECK. 8 A. M. Barometer.	Attached Thermometer.	Dry bulb.	Wet bulb.	Relative humidity.	4 P. M. Barometer.	Attached Thermometer.	Dry bulb.	Wet bulb.	Relative humidity.	10 P. M. Barometer.	Attached Thermometer.	Dry bulb.	Wet bulb.	Relative humidity.	BERTH DECK. 8 A. M. Dry bulb.	Wet bulb.	Relative humidity.	4 P. M. Relative humidity.	10 P. M. Dry bulb.	Wet bulb.	Relative humidity.	WIND.	WEATHER.	Carbonic acid corrected for Temp. and Pressure, per 1,000 volumes.	Number of sick, excluding injuries.	REMARKS.
In the deck	1	30.42		-16.67			30.48		-17.50			30.55		-19.44			13.5	11.5	72	77.75	14	12	78	N	bc		0	Atmosphere charged with steam ~~vapor~~ from engine in deck
"	2	30.64		-21.67			30.64		-21.50			30.70		-23.33			12	10	76	72.5	13	12	88	N	oc		0	Atmosphere charged with steam from engine in deck house.
"	3	30.62		-21.67			30.295		-21.28			30.48		-21.11			9	8	86	92.5	13	11	77	E	bc		0	" " " " " "
"	4	30.32		-21.11			30.22		-19.72			30.22		-20.56			13.5	12	83	78	12	11.5	94	Calm	b		0	" " " " " "
"	5	30.18		-17.78			+30.18		-22.78			30.24		-25.00			14	13.5	94.5	77	12.5	11.5	76.5	S/W	bc		0	" " " " " "
"	6	30.32		-24.33			+30.32		-25.78			30.30		-30.00			12	10.5	71	74	17	14.5	77.5	W/N	bc		0	" " " " " "
"	7	30.24		-30.00			30.19		-30.28			30.32		-29.72			13	12	88	67	16	14.5	84	NE/E	b		0	" " " " " "
"	8	30.49		-27.22			30.475		-26.11			30.48		-25.00 ~~24.44~~			13	12	88	87.5	10	[illegible]	86	E½S	bc		0	" " do. " "
"	9	30.15		-21.67 ~~24.67~~			30.07		-19.72			29.27		-17.78			8	7	86	87	11.5	10.5	88	SE	oc		0	" " " " "
"	10	29.61		-19.72			29.70		-15.56			29.64		-13.89			11	10	87	76.5	14.5	13	83	SE	oc	2.510	0	Cabin. 10 p.m. 2,510
"	11	29.50		-13.89			29.56		-13.61			29.74		-14.44			15	13.5	83	89	14	12.5	83.5	S½W	oc		0	" " " " " "
"	12	29.99		-26.67			30.04		-27.89			30.16		-28.33			15	12.5	73	83.5	15	13.5	83.5	W/S	bc		0	" " " " "
"	13	29.92		-21.11			29.784		-16.11			29.80		-14.44			18 ~~12.5~~	16	80	83	18.5	16.5	77.25	E/N	oc		0	" " " " "
"	14	30.06		-25.00			30.193		-28.78			30.30		-28.38			13½	12	83	75	16	15	89	W/N	oc		0	" " " " "
"	15	30.02		-20.56			29.92		-18.06			30.03		-19.44			15½	14	84	89	16.5	15	84	E/N	bc		0	" " "
"	16	30.30		-29.44			30.38		-32.28			30.58		-32.22			12	10	76	75	17.5	16	85	W/N	oc	3.975	0	Berth deck 10 p.m. "
"	17	30.31		-27.22			30.03		-21.11			29.80		-16.67			14	13	89	80	18	15.5	80.5	E/N	oc		0	" " " "
"	18	29.92		-21.11			30.08		-31.56			30.32		-32.22			15	13.5	83.5	79	15.5	14.5	85.25	W	oc		0	
"	19	30.32		-32.22			30.10		-23.06			30.05		-18.89			14	13	89	82	15.5	14	83	E/N	oc		0	" "
"	20	30.75		-16.11			29.575		-13.22			29.44		-11.11			11.5	10	8[illegible]	89	17	15.5	85	ENE	ocs		0	" " " "
"	21	29.08		-17.78			29.06		-22.56			29.33		-28.89			15	14	89	78	16	15	89	W/N	Snow		0	" " "
"	22	30.54		-28.33			29.82		-27.67			29.96		-25.56			14	12.5	83.5	83.5	16.8	15	81	W/S	bc		0	" " "
"	23	31.12		-26.67			30.096		-28.22			29.13		-27.78			16	14½	84	83.5	16.5	15	84	NW/S	oc		0	" " "
"	24	30.00		-20.56			29.815		-18.72			29.90		-18.89			16	14.5	84	84	18	16	80	ENE	oc		0	" " "
"	25	30.00		-20.00			29.97		-16.11			29.87		-14.44			16	15	87	72	14½	13	88	E/N	oc		0	" " "
"	26	29.64		-11.67			29.56		-14.11			29.52		-15.00			15.5	14	84	84	18.5	14.5	77.25	ESE	oc		1	" " —
"	27	29.45		-25.56			29.505		-27.50			29.64		-32.22			20	18.5	86	95	16.5	15.5	~~89.5~~	W	bc		4	" " " "
"	28	29.92		-32.22			30.01		-31.67			30.02		-32.39			15	13	78	84	16	14	79	W	bc		1	" " " "
"	29	29.90		-21.44			29.84		-31.11			29.84		-32.22			14	13	89	78	16	14.5	84	S	bc		1	" " " "
"	30	29.97		-31.67			29.72		-31.11			29.70		-31.67			17.5	16	85	78	15	14	89	[illegible]	bc		1	" " " "
"	31	29.69		-28.89			29.73		-27.78			29.61		-29.44			17	16	85	84.25	16½	15½	90.5	S.W	bc		2	" " " "
	AVERAGE	[illegible]		[illegible]			29.9		[illegible]										[illegible]		15.3	13.7	83.6	Variable	bc 17	2.510	0.2	[illegible]

Observations for carbonic acid should be made at least once a week, and the air of the berth deck at night or early [morn]ing should be selected. The results will not be entered unless the observer is certain of their accuracy.
The time and circumstances of observations for carbonic acid and the wetting of the decks *from any cause* will be [entered in the col]umn of Remarks.
Same instruments to be used in all hygrometric observations.

[illegible] 2. 8207

Surgeon, U. S. N.

For ascertaining the amount of carbonic acid in the air the following apparatus is supplied:

Two glass jars, cubic capacity marked in cubic centimeters.

India-rubber stoppers, and sheet india rubber to tie over necks of jars.

Glass measure graduated to 60 c. c.

One Mohr's burette, 60 c. c., graduated into tenths.

Glass rods.

Glass bottle of one liter capacity.

Bottle containing papers of crystallized oxalic acid of 2.25 grammes each.

Bottle containing litmus or turmeric paper.

A small bellows, or, in its absence, a Davidson's syringe may be used.

Lime water and distilled water.

Directions: Pettenkofer's method is to be followed. For those not familiar with it the following process, extracted from Wilson's Hand-Book of Hygiene, is recommended:

The analysis depends on the relative alkalinity of lime water before and after it has absorbed the carbonic acid in the sample of air examined. 2.25 grammes of crystallized oxalic acid are dissolved in 1 liter of distilled water; 1 c. c. of this solution exactly neutralizes 1 milligramme of lime, and hence the amount of lime in a given quantity of lime water can be determined by adding the solution of oxalic acid until the point of neutralization is reached. The amount of oxalic acid required for neutralization expresses the alkalinity of the lime water. If the alkalinity of the lime water be known before and after it has absorbed the carbonic acid in the air contained in the glass jar, the difference will give the amount of lime in milligrammes which has united with the carbonic acid, and the amount of the latter is obtained by calculating according to the atomic weights.

The jar should be perfectly clean and dry. The air to be examined is forced into the jar by a pair of bellows, or a bellows-pump may be used. In either case the nozzle should reach the bottom of the jar.

After the jar has been filled, 60 c. c. of lime water are introduced, the mouth of the jar closed by the stopper, and the stopper secured by a tightly-fitting india-rubber cap. The jar is then well shaken so that the lime water is made to thoroughly wash the contained air, and afterward is left to stand at least eight hours and not more than twenty-four; 60 c. c. are introduced in order that 30 may be taken out for analysis.

Thirty cubic centimeters of lime are poured into the graduated glass and its alkalinity determined by the test solution. Then 30 c. c. are taken from the jar and the alkalinity also determined. The difference is doubled to account for the 30 c. c. left in the jar, and the product gives the amount of lime which has combined with the carbonic acid. The amount of the latter is obtained by converting weight into volume according to the atomic weights, and in one sum by the factor .39748+.

The following rule will simplify the calculation: Multiply the difference between the alkalinity of the lime water before and after it has been placed in the jar by 795 and divide this sum by the number of cubic centimeters in the jar, minus 60. The result will be the ratio of carbonic acid per 1,000 volumes.

A correction must be made for temperature as it is above or below the standard of 62° Fahrenheit. As the coefficient of expansion of air is .0020361 for every degree of Fahrenheit, the rule for correction may be stated with sufficient accuracy thus: For every 5° Fahrenheit above 62° add 1 per cent. to the amount of carbonic acid calculated as above, and deduct the same percentage for every 5° below 62°.

The formula for the correction for pressure is as follows:

30 : observed height of bar. : : capacity : z.

The result expressed by z is substituted for the actual capacity of the jar in the calculation for carbonic acid.

Atmospheric Observations on board U. S. S Arctic Str Jeannette ; for the month of January , 1880.

Place.	Date.	Spar deck 10 A.M. Barometer.	10 A.M. Dry bulb.	1 P.M. Barometer.	1 P.M. Dry bulb.	10 P.M. Barometer.	10 P.M. Dry bulb.	Berth deck 10 A.M. Dry bulb.	10 A.M. Wet bulb.	10 A.M. Relative humidity.	1 P.M. Relative humidity.	10 P.M. Dry bulb.	10 P.M. Wet bulb.	10 P.M. Relative humidity.	Wind.	Weather.	Carbonic acid collected for Temp. and Pressure, in 1,000 volumes.	Number of sick, including injuries.	Remarks.
	1	30.20	-38.8	29.42	-39.2	30.63	-39.4	19.5	18	87.5	80	15	13	88	wnw	bc		1	Deck house damp from steaming. Condensation in forecastle
	2	30.80	-39.4	30.88	-38.3	31.06	-39.4	14.	12	78	78	13	12	78	nw	"		1	" " " " " " "
	3	31.05	-37.0	30.85	-32.7	30.72	-31.1	11.5	10	81.5	87	11.5	10.5	90.5	ene	"		1	" " " " " " "
	4	30.36	-25.0	30.34	-20.9	30.29	-20.6	14	12	78	82.5	16	14	79	se/e	"		1	" " " " " " "
	5	30.46	-32.2	30.57	-35.0	30.72	-34.4	15.5	14.5	89.5	88	16	15	89	calm	"		1	" " " " " " "
	6	30.74	-33.3	30.72	-33.0	30.80	-30.0	17	16	90	83	15.5	14	84	ene	"		1	" " " " " " "
	7	30.96	-28.0	30.57	-24.4	30.62	-24.7	16	15	88	83.5	15.8	14	81	ese	"		1	" " " " " " "
	8	30.64	-28.3	30.55	-27.2	30.55	-23.3	15	14	89	83.5	14	12	78	"	"		1	" " " " " " "
	9	30.40	-27.2	30.33	-28.3	30.40	-23.8	16.5	11	46.5	100	18	16	80	wsw	"	Berth deck 12 p.m.	1	" " " " " " "
	10	30.50	-29.7	30.44	-28.3	30.43	-27.2	18.5	17.0	85	75	19.5	15.5	65.5	calm	"		1	" " " " " " "
	11	30.36	-23.3	30.36	-21.8	30.47	-21.1	19.5	17.5	91.2	80	18	16	80	w	oc		1	" " " " " " "
	12	30.[illegible]	-20.5	30.44	-23.8	30.45	-24.4	17.5	16	85	76	18	16	80	calm	"	2.854	1	" " " " " " "
	13	30.50	-32.5	30.38	-36.1	30.32	-37.2	16	15	89	80	18	16	80	"	bc		1	" " " " " " "
	14	30.14	-37.2	30.06	-35.8	29.96	-33.8	18	16.5	85	80	17	15.5	85	w/n	"		1	" " " " " " "
	15	30.72	-32.2	29.66	-31.3	29.91	-34.1	15.5	13.5	83.5	78	16	14	79	w/s	"		1	" " " " " " "
	16	29.51	-27.2	29.47	-25.0	29.60	-28.3	14	12	78	81	17	15	80	wsw	oc		1	" " " " " " "
	17	29.81	-38.8	29.92	-40.8	30.01	-41.1	17	15	80	78	16	13	70	wnw	bc		1	" " " " " " "
	18	30.14	-43.8	30.20	-44.7	30.24	-45.5	16	14	79	85	16.5	14.5	81.5	nw/n	bcz		1	" " " " " " " in deck house
	19	30.31	-44.4	30.24	-43.6	30.27	-42.2	17	16.5	85	82	9.5	8	80	wnw	"		1	Forecastle damp from leak in bows, pumps going continuously
	20	30.20	-40.7	30.10	-38.8			12	10.7	82	78				calm	bs		1	" " " " " " "
	21	29.93	-37.7	29.97	-36.6	30.06	-37.5	12	11.8	94	79	12	10	76	wsw	bc		1	" " " " " "
	22	30.11	-38.3	30.22	-36.9	30.28	-33.0	13.5	12.5	88.5	88	14	13	89	w/n	"		1	" " " " " "
	23	30.42	-34.4	30.46	-35.2	30.45	-34.2	13.8	13.5	95	88	14	13	89	w	"		1	" " " " " "
	24	30.42	-31.6	30.42	-32.6	30.47	-33.1	14.5	13.5	88.5	89	16.5	15	84	calm	oc		1	" " " " " "
	25	30.51	-35.8	30.48	-35.3	30.46	-35.8	14.5	14	94	88.5	16.5	15.5	90.5	"	bc		1	" " " " " "
	26	30.36	-35.0	30.24	-35.1	30.23	-35.5	16	15	89	89	16	15	89	ese	"		1	" " " " " "
	27	30.04	-38.3	30.01	-35.4	30.04	-36.6	17	16	90	90	18	16	80	"	"		1	Wet from evaporation
	28	30.00	-35.5	29.95	-34.4	29.84	-33.1	14	10	81	85	16	15	89	w/n	"		1	" " "
	29	29.82	-35.2	29.89	-35.5	29.98	-37.2	17.5	17	85	80	17	15	80	ese	"		1	" " "
	30	30.06	-40.5	29.99	-40.2	30.02	-39.7	15.5	14	84	84	17	15	80		"		1	" " "
	31	30.68	-40.9	30.06	-40.8	30.10	-41.1	16	15	89	89	15	14	89	w/n	"		1	" " "
Average		30.32	-33.7	30.23	-33.7	30.01	-36.6	15.[illegible]	[illegible]	[illegible]	85	15.8	14	80.1	14 northerly, 8 easterly	bc 24, bs 3, oc 4		1	Damp.

Observations for carbonic acid should be made at least once a week, and the air of the berth deck at night or early in the morning should be selected. The results will not be entered unless the observer is certain of their accuracy.
The time and circumstances of observations for carbonic acid and the wetting of the decks *from any cause* will be entered in the column of Remarks.
Same instruments to be used in all hygrometric observations.

Surgeon, U. S. N.

For ascertaining the amount of carbonic acid in the air the following apparatus is supplied:

Two glass jars, cubic capacity marked in cubic centimeters.

India-rubber stoppers, and sheet india rubber to tie over necks of jars.

Glass measure graduated to 60 c. c.

One Mohr's burette, 60 c. c., graduated into tenths.

Glass rods.

Glass bottle of one liter capacity.

Bottle containing papers of crystallized oxalic acid of 2.25 grammes each.

Bottle containing litmus or turmeric paper.

A small bellows, or, in its absence, a Davidson's syringe may be used.

Lime water and distilled water.

Directions: Pettenkofer's method is to be followed. For those not familiar with it the following process, extracted from Wilson's Hand-Book of Hygiene, is recommended:

The analysis depends on the relative alkalinity of lime water before and after it has absorbed the carbonic acid in the sample of air examined. 2.25 grammes of crystallized oxalic acid are dissolved in 1 liter of distilled water; 1 c. c. of this solution exactly neutralizes 1 milligramme of lime, and hence the amount of lime in a given quantity of lime water can be determined by adding the solution of oxalic acid until the point of neutralization is reached. The amount of oxalic acid required for neutralization expresses the alkalinity of the lime water. If the alkalinity of the lime water be known before and after it has absorbed the carbonic acid in the air contained in the glass jar, the difference will give the amount of lime in milligrammes which has united with the carbonic acid, and the amount of the latter is obtained by calculating according to the atomic weights.

The jar should be perfectly clean and dry. The air to be examined is forced into the jar by a pair of bellows, or a bellows-pump may be used. In either case the nozzle should reach the bottom of the jar.

After the jar has been filled, 60 c. c. of lime water are introduced, the mouth of the jar closed by the stopper, and the stopper secured by a tightly-fitting india-rubber cap. The jar is then well shaken so that the lime water is made to thoroughly wash the contained air, and afterward is left to stand at least eight hours and not more than twenty-four; 60 c. c. are introduced in order that 30 may be taken out for analysis.

Thirty cubic centimeters of lime are poured into the graduated glass and its alkalinity determined by the test solution. Then 30 c. c. are taken from the jar and the alkalinity also determined. The difference is doubled to account for the 30 c. c. left in the jar, and the product gives the amount of lime which has combined with the carbonic acid. The amount of the latter is obtained by converting weight into volume according to the atomic weights, and in one sum by the factor .39748+.

The following rule will simplify the calculation: Multiply the difference between the alkalinity of the lime water before and after it has been placed in the jar by 795 and divide this sum by the number of cubic centimeters in the jar, minus 60. The result will be the ratio of carbonic acid per 1,000 volumes.

A correction must be made for temperature as it is above or below the standard of 62° Fahrenheit. As the coefficient of expansion of air is .0020361 for every degree of Fahrenheit, the rule for correction may be stated with sufficient accuracy thus: For every 5° Fahrenheit above 62° add 1 per cent. to the amount of carbonic acid calculated as above, and deduct the same percentage for every 5° below 62°.

The formula for the correction for pressure is as follows:

$$30 : \text{observed height of bar.} :: \text{capacity} : z.$$

The result expressed by z is substituted for the actual capacity of the jar in the calculation for carbonic acid.

Atmospheric Observations on board U.S.S. Arctic Str Jeannette, for the month of February, 1880.

Place	Date	Spar deck 10 A.M. Bar.	10 A.M. Temp.	1 P.M. Bar.	1 P.M. Temp.	10 P.M. Bar.	10 P.M. Temp.	Berth deck 10 A.M. Dry	Wet	Rel. hum.	Dry	Wet	Rel. hum.	10 P.M. Dry	Wet	Rel. hum.	Wind	Weather	Carbonic acid	No.	Remarks
In The Pack	1	30.07	-42.22	30.10	~~[illegible]~~ -41.94	30.13	-41.67	14	13	89	13	12	88	13.5	12	83	WNW	bc		1	Deck damp from condensation -
"	2	30.012	-35.00	29.92	-31.94	29.82	-28.61	13	12	88	15	[illegible]	78	14.5	13.5	88.5	E/N	"		1	" " "
	3	29.98	-36.94	30.09	-39.44	30.198	-42.12	12	11	88	14	13	89	15	14	~~89~~	SSW	"		1	" " " "
"	4	30.08	-38.61	30.03	-34.44	30.025	-35.83	13	12	88	14	[illegible]	89	14	13	89	ENE	bc		1	" " " "
"	5	30.07	-40	30.08	-35.00	30.24	-34.72	12	11	88	12	[illegible]	88	14.5	13.5	88.5	SW/S	bc		1	" " " "
"	6	30.09	-31.94	29.94	-30.17	29.88	-31.11	13	12	88	14	13	89	15	14	89	SE/S	bc		1	" " " "
"	7	29.79	-37.78	29.78	-39.17	29.91	-40.00	13	12	88	12	11	88	15	14	89	E	bc		1	" " " "
"	8	29.98	-43.89	29.995	-42.83	30.03	-42.61	14	13	83	14	[illegible]	89	13	11	77	W/S	bc	BD. 11 P.M. 5.304	1	" " " "
"	9	30.02	-41.28	29.90	-42.22	29.91	-41.06	11.5	11	94	14	[illegible]	78	14	13	89	calm	bc		1	" " " "
"	10	29.71	-42.22	29.717	-42.33	29.655	-40.56	12	11	88	13.5	[illegible]	81	13	12	88	E/N	bc		1	" " " "
"	11	29.617	-40	29.517	-39.17	29.58	-40.83	13	12.5	94	12	[illegible]	88	14	13	89	SW	bc		1	" " " "
"	12	29.545	-38.61	29.582	-37.30	29.725	-38.39	12.5	12	94	11.5	[illegible]	87.75	12	11	88	SW/W	bc		1	" " " "
"	13	29.775	-33.89	29.77	-32.22	29.78	-33.06	12.5	11.5	88	14.5	[illegible]	88.5	13	12	88	SW/S	bc		1	" " "
"	14	29.81	-31.39	29.78	-34.06	29.77	-37.50	12.5	11	82	11	[illegible]	87	14.5	13.5	~~88.5~~	SSW	bc		1	" " " "
"	15	29.48	-33.61	29.43	-33.33	29.56	-38.89	15	14	89	12.5	[illegible]	88	14	13	89	NNE	oc		1	Deck wet from leaks through skin
	16	29.75	-43.61	29.81	-43.41	29.87	-40.78	13	12	88	11.5	[illegible]	74	12.5	11.5	88	N	BC		1	" " " "
"	17	29.60	-34.67	29.18	-34.17	28.78	-29.33	12.5	11.5	88	12	[illegible]	88	11.5	11	94	E	oc		1	Decks wet from condensation -
"	18	28.62	-29.33	28.805	-30.83	29.06	-35.28	~~14.5~~ 10	~~13.5~~ 9	~~88.5~~ 86	11.5	[illegible]	88.5	12.5	12	94	W	oc		1	" " " "
"	19	29.34	-40	29.47	-41.11	29.58	-41.67	13	12.5	94	11.5	11	94	12	11	88	WSW	oc		1	" " " "
"	20	29.72	~~-40.89~~ -42.22	29.71	~~-40.67~~ -41.67	29.78	-41.67	13	12	88	12	[illegible]	86	13	12	88	SW	bg		1	" " " "
"	21	29.83	-43.33	29.81	-43.33	29.82	-43.33	8.5	8	93	8.5	[illegible]	93	13	12	88	WSW	bg		1	" " " "
	22	29.82	-41.67	29.77	-40	29.78	-40	12	11	88	[illegible]	[illegible]	75	13	12	88	WNW	oc		1	" " " "
	23	29.72	-39.17	29.78	-38.[illegible]8	29.84	-40.56	12.5	12	94	[illegible]	[illegible]	85	8.5	8	93	W	bg		1	" " " "
"	24	30.03	-40.83	30.08	-41.94	30.15	-41.67	9.5	9	93	11	[illegible]	86	11	10	87	W/S	b[illegible]		1	" " " "
	[25]	30.17	-39.44	30.183	-38.33	30.20	-40.56	8.5	8	93	11	[illegible]	86	13	11.5	83.5	calm	bg		1	" " " "
"	[26]	30.11	-40.83	30.08	-40.83	30.11	-42.78	13	12	88	11	[illegible]	68	12.5	12	94	"	bc		1	" " " "
"	27	30.23	-39.44	30.23	-41.11	30.18	-40.56	10	9	86	10	[illegible]	94	14	13	89	"	bc		1	" " " "
"	28	30.15	-40.83	30.19	-40	30.215	-42.22	11	10	87	11	[illegible]	58	12	11.5	94	S/W	bc		1	" " " "
"	29	30.12	-42.78	30.13	41.67	30.25	-43.89	10.5	10	94	12	[illegible]	82	10	9.5	98	NNE	bc		1	" " " "
	Means	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	-38.9	11.6	10.5	89.8	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		1	

Observations for carbonic acid should be made at least once a week, and the air of the berth deck at night or early in [illegible] should be selected. The results will not be entered unless the observer is certain of their accuracy.
The time and circumstances of observations for carbonic acid and the wetting of the decks *from any cause* will be en[illegible] of Remarks.
Same instruments to be used in all hygrometric observations.

Surgeon, U. S. N.

For ascertaining the amount of carbonic acid in the air the following apparatus is supplied:

Two glass jars, cubic capacity marked in cubic centimeters.

India-rubber stoppers, and sheet india rubber to tie over necks of jars.

Glass measure graduated to 60 c. c.

One Mohr's burette, 60 c. c., graduated into tenths.

Glass rods.

Glass bottle of one liter capacity.

Bottle containing papers of crystallized oxalic acid of 2.25 grammes each.

Bottle containing litmus or turmeric paper.

A small bellows, or, in its absence, a Davidson's syringe may be used.

Lime water and distilled water.

Directions: Pettenkofer's method is to be followed. For those not familiar with it the following process, extracted from Wilson's Hand-Book of Hygiene, is recommended:

The analysis depends on the relative alkalinity of lime water before and after it has absorbed the carbonic acid in the sample of air examined. 2.25 grammes of crystallized oxalic acid are dissolved in 1 liter of distilled water; 1 c. c. of this solution exactly neutralizes 1 milligramme of lime, and hence the amount of lime in a given quantity of lime water can be determined by adding the solution of oxalic acid until the point of neutralization is reached. The amount of oxalic acid required for neutralization expresses the alkalinity of the lime water. If the alkalinity of the lime water be known before and after it has absorbed the carbonic acid in the air contained in the glass jar, the difference will give the amount of lime in milligrammes which has united with the carbonic acid, and the amount of the latter is obtained by calculating according to the atomic weights.

The jar should be perfectly clean and dry. The air to be examined is forced into the jar by a pair of bellows, or a bellows-pump may be used. In either case the nozzle should reach the bottom of the jar.

After the jar has been filled, 60 c. c. of lime water are introduced, the mouth of the jar closed by the stopper, and the stopper secured by a tightly-fitting india-rubber cap. The jar is then well shaken so that the lime water is made to thoroughly wash the contained air, and afterward is left to stand at least eight hours and not more than twenty-four; 60 c. c. are introduced in order that 30 may be taken out for analysis.

Thirty cubic centimeters of lime are poured into the graduated glass and its alkalinity determined by the test solution. Then 30 c. c. are taken from the jar and the alkalinity also determined. The difference is doubled to account for the 30 c. c. left in the jar, and the product gives the amount of lime which has combined with the carbonic acid. The amount of the latter is obtained by converting weight into volume according to the atomic weights, and in one sum by the factor .39748+.

The following rule will simplify the calculation: Multiply the difference between the alkalinity of the lime water before and after it has been placed in the jar by 795 and divide this sum by the number of cubic centimeters in the jar, minus 60. The result will be the ratio of carbonic acid per 1,000 volumes.

A correction must be made for temperature as it is above or below the standard of 62° Fahrenheit. As the coefficient of expansion of air is .0020361 for every degree of Fahrenheit, the rule for correction may be stated with sufficient accuracy thus: For every 5° Fahrenheit above 62° add 1 per cent. to the amount of carbonic acid calculated as above, and deduct the same percentage for every 5° below 62°.

The formula for the correction for pressure is as follows:

30 : observed height of bar. : : capacity : z.

The result expressed by z is substituted for the actual capacity of the jar in the calculation for carbonic acid.

Atmospheric Observations on board U.S.S *Arctic Str. Jeannette* , for the month of *March* , 18*80*.

Place	Day	Spar deck 1 A.M.		1 P.M.		10 P.M.		Berth deck 10 A.M. Dry bulb	Wet bulb				10 P.M. Dry bulb	Wet bulb	Relative humidity	Wind	Weather		No.	Remarks
In the pack	1	30.50	-45.7	30.55	-45.72	30.66	-42.50	9.5	8.5	86.7	8	86	10.5	10	96	w/n	bc		1	Decks wet from steam + condensation
	2	30.64	-45	30.545	-42.78	30.295	-45.06	8	7.5	93	9	84	13	12	88	nne	bc		1	" " " " "
	3	30.36	-42.78	30.33	-41.11	30.37	-43.61	9.5	9	93.5	14	89	12.5	11.5	93.2	SNE	bc		1	" " " " "
	4	30.35	-43.89	30.36	-42.22	31.40	-44.44	18	16.5	85	14	89	15	14	89	bc	clm		1	" " "
	5	30.20	-39.72	30.13	-38.33	30.11	-40.56	14	13	89	14	89	15	13	78	bc	E		1	" " " "
	6	30.15	-36.11	29.98	-34.44	30.00	-35.56	11	10	87	14	89	10.5	10	96	bc	E		1	" " " "
	7	29.90	-31.11	29.78	-36	29.72	-33.89	14	13	89	12	84	17	15	80	bc	E/s		1	" " " "
	8	29.54	-37.22	29.53	-36.11	29.57	-37.22	16.5	15	84	[illegible]	[illegible]	17	15	80	bc	"		1	" " " "
	9	29.66	-32.78	29.70	-30.00	29.84	-31.78	15.5	14	84	15.5	80.5	17	16	90	bc	clm		1	" " " "
	10	29.84	-29.44	29.84	28.33	29.94	-32.22	17.5	16	85	16.5	84	15.5	14	84	bc	"		1	" " " "
	11	29.[illegible]	-33.89	30.08	-30.89	30.18	-25.00	18.5	16.5	85	16	84	16.5	15	84	bc	w		1	" " " "
	12	30.05	-20.28	29.94	-20.00	29.72	-21.11	16	14.5	84	16.5	84	18	16	80	bc	[illegible]			" " " "
	13	29.36	-18.33	29.44	-19.17	29.63	-23.33	17	15	80	18	92.5	16.5	15	84	bc	NNE		1	" " " "
	14	29.62	24.17	29.75	-24.44	29.96	-25.56	15	14	89	16.5	84	15	14	89	bc	WNW		1	" "
	15	30.16	-29.72	30.25	-30.00	30.34	-32.22	16	14.5	84	11	92	17	15.5	85	bc	NE		1	" "
	16	30.48	-33.89	30.54	-32.78	30.45	-37.22	19.5	18	86	17.5	75	17.5	16	85	bc	N		1	" " " "
	17	30.60	-34.44	30.54	-31.67	30.58	-33.61	18	17	90	15.5	84.5	17	16	90	bc	NW		1	" " " "
	18	30.40	-30.56	30.28	-28.33	30.23	-28.33	16	15	89	16.5	84	16	15	89	bc	W		1	" " " "
	19	30.11	-28.33	30.13	-27.50	30.14	-26.67	14.5	13	83	15.5	94.5	15	14	89	bc	W		1	" " " "
	20	30.18	-27.78	29.93	-25.28	30.03	-31.67	14.5	13	88	16.5	84	16.5	15	84	bc	SW		1	" " " "
	21	30.21	-28.33	30.03	-26.33	29.70	-21.67	15.5	14.5	89.5	16	94.5	15	14	89	bc	WSW		1	" " " "
	22	29.34	-20	29.45	-21.94	29.57	-2[illegible]	16	15	89						bc	NEE		1	" " "
	23	29.63	-22.78	29.76	-25.56	29.87	-29.44	17	16	90	17	80	17	16	90	bc	WSW		1	" " " "
	24	29.90	-26.39	29.92	-25.83	30.02	-28.61	14	13	89	11	88	14	13	89	bc	SW		1	" " " "
		30.14	-28.00	30.4	-23.61	30.13	-21.67	15	13.5	83.5	15	76	17	15	80	bc	SW		1	" " " "
		29.74	-17.78	29.71	-15.28	29.71	-15.28	19.5	17	76	[illegible]	81	16	15	89	oc	NE		1	" " " "
	27	29.71	-12.22	29.71	-11.11	29.78	-11.11	15	14	89	[illegible]	80	18	16	80	oc	E		1	" " " "
		29.80	-8.33	29.72	7.61	29.71	-11.11	17	15	80	15	67.5	18.5	17	85	bc	ESE		1	" " " "
		29.86	-13.33	30.05	-15.28	30.19	-17.22	15	14	89	[illegible]	81	17	15	80	bc	SW		1	" " " "
		30.35	-18.61	30.87	-18.06	30.40	-18.33	19	16	72	[illegible]	81	17.5	15.5	81	bc	NNW		1	" " " "
		30.34	-16.47	29.83	-12.22	29.87	-13.72	15	13	78	[illegible]	90	18.5	17	85	ocs	ENE	13.8 2.349 10 P.M.	1	" " "
		[illegible]	[illegible]	[illegible]	[illegible]		-31.4	55	14	[illegible]				[illegible]	85			2.269		Cont

Observations for carbonic acid should be made at least once a week, and the air of the berth deck at night or early in [...] should be selected. The results will not be entered unless the observer is certain of their accuracy.
The time and circumstances of observations for carbonic acid and the wetting of the decks *from any cause* will be ent[ered under head] of Remarks.
Same instruments to be used in all hygrometric observations.

For ascertaining the amount of carbonic acid in the air the following apparatus is supplied:

Two glass jars, cubic capacity marked in cubic centimeters.

India-rubber stoppers, and sheet india rubber to tie over necks of jars.

Glass measure graduated to 60 c. c.

One Mohr's burette, 60 c. c., graduated into tenths.

Glass rods.

Glass bottle of one liter capacity.

Bottle containing papers of crystallized oxalic acid of 2.25 grammes each.

Bottle containing litmus or turmeric paper.

A small bellows, or, in its absence, a David-son's syringe may be used.

Lime water and distilled water.

Directions: Pettenkofer's method is to be followed. For those not familiar with it the following process, extracted from Wilson's Hand-Book of Hygiene, is recommended:

The analysis depends on the relative alkalinity of lime water before and after it has absorbed the carbonic acid in the sample of air examined. 2.25 grammes of crystallized oxalic acid are dissolved in 1 liter of distilled water; 1 c. c. of this solution exactly neutralizes 1 milligramme of lime, and hence the amount of lime in a given quantity of lime water can be determined by adding the solution of oxalic acid until the point of neutralization is reached. The amount of oxalic acid required for neutralization expresses the alkalinity of the lime water. If the alkalinity of the lime water be known before and after it has absorbed the carbonic acid in the air contained in the glass jar, the difference will give the amount of lime in milligrammes which has united with the carbonic acid, and the amount of the latter is obtained by calculating according to the atomic weights.

The jar should be perfectly clean and dry. The air to be examined is forced into the jar by a pair of bellows, or a bellows-pump may be used. In either case the nozzle should reach the bottom of the jar.

After the jar has been filled, 60 c. c. of lime water are introduced, the mouth of the jar closed by the stopper, and the stopper secured by a tightly-fitting india-rubber cap. The jar is then well shaken so that the lime water is made to thoroughly wash the contained air, and afterward is left to stand at least eight hours and not more than twenty-four; 60 c. c. are introduced in order that 30 may be taken out for analysis.

Thirty cubic centimeters of lime are poured into the graduated glass and its alkalinity determined by the test solution. Then 30 c. c. are taken from the jar and the alkalinity also determined. The difference is doubled to account for the 30 c. c. left in the jar, and the product gives the amount of lime which has combined with the carbonic acid. The amount of the latter is obtained by converting weight into volume according to the atomic weights, and in one sum by the factor .39748+.

The following rule will simplify the calculation: Multiply the difference between the alkalinity of the lime water before and after it has been placed in the jar by 795 and divide this sum by the number of cubic centimeters in the jar, minus 60. The result will be the ratio of carbonic acid per 1,000 volumes.

A correction must be made for temperature as it is above or below the standard of 62° Fahrenheit. As the coefficient of expansion of air is .0020361 for every degree of Fahrenheit, the rule for correction may be stated with sufficient accuracy thus: For every 5° Fahrenheit above 62° add 1 per cent. to the amount of carbonic acid calculated as above, and deduct the same percentage for every 5° below 62°.

The formula for the correction for pressure is as follows:

$$30 : \text{observed height of bar.} :: \text{capacity} : z.$$

The result expressed by z is substituted for the actual capacity of the jar in the calculation for carbonic acid.

Atmospheric Observations on board U. S. S. Jeannette, for the month of April, 1880

Place	Day	Spar deck 10 A.M. Barometer	10 A.M. Dry bulb	2 P.M. Barometer	2 P.M. Dry bulb	10 P.M. Barometer	10 P.M. Dry bulb	Berth deck 10 A.M. Dry bulb	10 A.M. Wet bulb	10 A.M. Relative humidity	2 P.M. Dry bulb	2 P.M. Wet bulb	2 P.M. Relative humidity	10 P.M. Dry bulb	10 P.M. Wet bulb	10 P.M. Relative humidity	Wind	Weather	Carbonic acid	No.	Remarks
In The Pack	1	29.86	-14.17	29.83	-14.44	29.79	-16.39	11.5	10.5	88	14.5	12	78	16.5	15.5	89.5	SW	BC		1	Decks damp from condensation
"	2	29.43	-12.78	29.27	-7.50	29.29	-14.44	9.5	8.5	86.7	13	12	88	16	15	89	NE	OC.s		1	" " " "
	3	29.40	-15.56	29.42	-18.89	29.51	-23.89	11	10	87	13	12	88	15	14	89	SW/S	ocf		1	" " " "
	4	29.60	-23.89	29.64	-21.67	29.73	-26.67	4	3	83	17.5	16	85	17	16	90	SW	ocz		1	" " " "
	5	29.80	-28.33	29.84	-25.72	29.94	-28.89	9.5	9	93.5	14	12	78	15	13	78	NW	bc		1	" " " "
	6	29.99	-27.22	29.99	-25.56	29.99	-30.83	9	7.5	79.5	14.5	13	83	15.5	14	84	WNW	bc		1	Berth deck damp. Spar deck frozen
	7	29.98	-25.00	29.99	-22.78	30.06	-26.11	7	6	85	14	13	89	14.5	13	83	"	bc		1	" " " " " "
	8	30.14	-21.67	30.14	-19.89	30.21	-27.50	8	7.5	93	18.5	17.5	90	15	14	89	SSW	bz		1	" " " " "
	9	30.20	-20.83	30.18	-18.33	30.18	-17.44	9	8	86	15	14	89	16.5	15	84	SW	bc		1	" " " " "
	10	30.02	-15	29.95	-12.22	30.05	-15	12	11	88	15	14	84	17	16	90	ESE	.ocm		1	" " " " "
	11	30.10	-11.94	29.94	-12.50	29.75	-13.89	13	12	88	19.5	17.5	81.25	19	17.5	85.5	NE	ocm		1	" " " " "
	12	29.53	-11.11	29.51	-8.33	29.53	-10	12.5	11	82	16.5	15	85	18	17	90	E	bc		1	" " " " "
	13	29.48	-11.67	29.57	-13.33	29.67	-12.50	12	11	88	17	15	80	18	15.5	75.5	W	ocm		1	Spar deck wet from melting
	14	29.76	-15	29.81	-11.67	29.86	-14.44	11	9	75	18.5	17	85	18	16.5	85	Calm	oc		1	" " " " "
	15	29.84	-15	29.82	-13.06	29.81	-15	16	15	89	18.5	17	85	20	18	81	SE	bc		1	" " " " "
	16	29.68	-13.89	29.66	-11.67	29.70	-17.22	12.5	11.5	88	17	16.5	85	17	16	90	SW/S	bc		1	" " " " "
	17	29.61	-15.56	29.51	-12.78	29.47	-15.56	12	10	76	16.5	15	85	17	15.5	85	S	bc		1	" " " " "
	18	29.39	-10	29.41	-8.72	29.53	-15.56	11	10	87	16	15	89	18.5	16.5	81.5	S.	o.cs		1	Spar deck frozen + melting. B D damp from cleaning -
	19	29.68	-16.67	29.76	-12.89	29.83	-14.44	15	14	89	15.5	14	84	16.5	15	84	N.N.W	oc		1	" " " " , " dry -
	20	29.88	-12.78	29.78	-9.56	29.81	-9.44	12.5	11.5	88	12.5	11	82	14.5	13	83	ENE	ocm		1	" " " " ", " damp condensation
	21	29.74	-10	29.70	-8.33	29.78	-16.67	13.5	12	88	14	12.5	83.5	16	14	79	E	ocs		1	" " " " " " "
	22	29.68	-8.33	29.69	-8.89	29.77	-17.78	12	10.5	79	15.5	14	84	15	14	89	E/S	oc		1	" " " " " " "
	23	29.81	-16.11	29.83	-9.72	29.90	-14.11	9	8	86	11.5	10.5	87	17	15	80	ENE	bc		1	" " " "
	24	29.96	-10	30.00	-9.44	30.06	-11.67				19	17	81	18.7	15.5	69		oc		1	" " " "
	25	30.09	-9.72	30.10	-9.72	30.16	-20	11	10	87	19.5	18	86	16.5	15	84	SE	oc.		1	" " " .. from Washing
	26	30.09	-8.89	30.04	-5.83	30.02	-7.22	11	10	87	14.5	12.5	78	17	15	80	ESE	bc	.45	1	" " " dry –
	27	29.96	-5.56	29.95	-3.89	29.98	-5.56	12.5	11	82	17.5	16	85	17	15.5	85	SE	oc.s		1	" " " "
	28	29.93	-4.44	29.86	-5	29.84	-6.67	14	12	78	17	15.5	85	17	15.5	86	SSE	ocm		1	" " " "
	29	29.74	-7.78	29.70	-3.06	29.77	-12.78	11.5	10.5	87	14	12.5	83.5	18	15.5	76.5	E	bc		1	" " " "
	30	29.82	-5	29.86	-1.56	29.94	-11.11	14	13	89	16.5	15	85	17.5	16	85	SSE	bc		1	" " " "
	31																				
Average		29.80	-13.9	29.79	-12.1	29.83	-16.2	11.2	10.4	85.9	15.8	14.3	84.3	16.9	15.2	80.7	Southerly	bc 16 oc 14	4.5	1	Wet or damp-

Observations for carbonic acid should be made at least once a week, and the air of the berth deck at night or early in the morning should be selected. The results will not be entered unless the observer is certain of their accuracy.
The time and circumstances of observations for carbonic acid and the wetting of the decks *from any cause* will be entered in column of Remarks.
Same instruments to be used in all hygrometric observations.

24th × Peculiarly favorable circumstances

Surgeon, U. S. N.

For ascertaining the amount of carbonic acid in the air the following apparatus is supplied:

Two glass jars, cubic capacity marked in cubic centimeters.

India-rubber stoppers, and sheet india rubber to tie over necks of jars.

Glass measure graduated to 60 c. c.

One Mohr's burette, 60 c. c., graduated into tenths.

Glass rods.

Glass bottle of one liter capacity.

Bottle containing papers of crystallized oxalic acid of 2.25 grammes each.

Bottle containing litmus or turmeric paper.

A small bellows, or, in its absence, a Davidson's syringe may be used.

Lime water and distilled water.

Directions: Pettenkofer's method is to be followed. For those not familiar with it the following process, extracted from Wilson's Hand-Book of Hygiene, is recommended:

The analysis depends on the relative alkalinity of lime water before and after it has absorbed the carbonic acid in the sample of air examined. 2.25 grammes of crystallized oxalic acid are dissolved in 1 liter of distilled water; 1 c. c. of this solution exactly neutralizes 1 milligramme of lime, and hence the amount of lime in a given quantity of lime water can be determined by adding the solution of oxalic acid until the point of neutralization is reached. The amount of oxalic acid required for neutralization expresses the alkalinity of the lime water. If the alkalinity of the lime water be known before and after it has absorbed the carbonic acid in the air contained in the glass jar, the difference will give the amount of lime in milligrammes which has united with the carbonic acid, and the amount of the latter is obtained by calculating according to the atomic weights.

The jar should be perfectly clean and dry. The air to be examined is forced into the jar by a pair of bellows, or a bellows-pump may be used. In either case the nozzle should reach the bottom of the jar.

After the jar has been filled, 60 c. c. of lime water are introduced, the mouth of the jar closed by the stopper, and the stopper secured by a tightly-fitting india-rubber cap. The jar is then well shaken so that the lime water is made to thoroughly wash the contained air, and afterward is left to stand at least eight hours and not more than twenty-four; 60 c. c. are introduced in order that 30 may be taken out for analysis.

Thirty cubic centimeters of lime are poured into the graduated glass and its alkalinity determined by the test solution. Then 30 c. c. are taken from the jar and the alkalinity also determined. The difference is doubled to account for the 30 c. c. left in the jar, and the product gives the amount of lime which has combined with the carbonic acid. The amount of the latter is obtained by converting weight into volume according to the atomic weights, and in one sum by the factor .39748+.

The following rule will simplify the calculation: Multiply the difference between the alkalinity of the lime water before and after it has been placed in the jar by 795 and divide this sum by the number of cubic centimeters in the jar, minus 60. The result will be the ratio of carbonic acid per 1,000 volumes.

A correction must be made for temperature as it is above or below the standard of 62° Fahrenheit. As the coefficient of expansion of air is .0020361 for every degree of Fahrenheit, the rule for correction may be stated with sufficient accuracy thus: For every 5° Fahrenheit above 62° add 1 per cent. to the amount of carbonic acid calculated as above, and deduct the same percentage for every 5° below 62°.

The formula for the correction for pressure is as follows:

30 : observed height of bar. : : capacity : z.

The result expressed by z is substituted for the actual capacity of the jar in the calculation for carbonic acid.

Atmospheric Observations on board U. S. S Jeannette, for the month of May, 1880.

Place	Date	Spar Deck 10 A.M. Bar.	Spar Deck 10 A.M. Dry	Spar Deck 4 P.M. Bar.	Spar Deck 4 P.M. Dry	Spar Deck 10 P.M. Bar.	Spar Deck 10 P.M. Dry	Berth Deck 10 A.M. Dry bulb	Wet bulb	Relative humidity			Berth Deck 10 P.M. Dry bulb	Wet bulb	Relative humidity	Wind	Weather	Carbonic acid	No.	Remarks
In the pack	1	30.00	-4.44	29.97	-1.28	30.01	-13.33	12	10.5	82	-14.5	78	15	13.5	83.5	N	b		1	Dry on both Decks
	2	29.92	-6.39	29.87	-6.67	29.79	-8.89	6	5	85	13	82	14	13	89	NNE	bc		1	" " " "
	3	29.65	-6.11	29.46	-8.33	29.38	-8.33	9.5	8	80	13	88	12.5	11.5	88.25	W	oc		1	S.D melting snow. B.D dry -
	4	29.48	-10.28	29.61	-9.17	29.73	-10.56	12.5	11	82.5	16	89	15.5	13.5	79	NW	bc		1	" " " " " "
	5	29.75	-13.33	29.77	-16.11	29.81	-15.56	12	11	[illegible]	14.5	79	13	12	78	N	oc	B.D. 10 pm	1	" " " snow " "
	6	29.90	-17.78	29.96	-19.44	30.06	-18.33	9	8	86	14.5	83	13	12	78	N	bc	1.69	1	" " frozen " " "
	7	30.14	-13.61	30.13	-12.89	30.11	-18.33	9	7.5	79.5	11	87	12	10	76	NE/E	oc		1	" " " " " "
	8	29.78	-15.00	29.62	-11.50	29.60	-11.11	10	8.5	80	13	88	12.5	11	72	E	ocm		1	" " " " " "
	9	29.62	-6.11	29.73	-9.17	29.88	-14.44	9.5	9	98	15	78	17.5	16	85	E	ocm.s		1	" " melting " " " washed -
	10	30.14	-15	30.25	-13.61	30.30	-5.56	13.5	12	83.5	14	79.5	16	14.5	79.5	W	bc		1	" " dry " " dry -
	11	30.26	-15	30.18	-14.56	30.21	[illegible]	12	11	88	15	89	14	12.5	88	WNW	oc		1	" " " " " "
	12	30.19	~~15~~	30.14	-13.89	30.14	-13.89	14	12	78	16	89	14.5	12.5	78	"	ocm		1	" " " " " "
	13	30.12	11.67 ~~-18.33~~	30.13	-11.11	30.16	-18.33	11	10	87	13	88	12	11	88	NE/E	"		1	" " " " " "
	14	30.19	-12.89	30.22	-10.56	30.28	[illegible]	8	7	86	13	82.5	14.5	13.5	89.75	ENE	oc			" " " " " "
	15	30.23	-11.11	30.16	-10.56	30.28	-12.78	10	9	86	14	89	13.5	12	83	ESE	oc		1	" " " " " "
	16	30.38	-9.44	30.28	[illegible]	30.20	-11.67	14	13	89	11	97	11	10	87	SE	oc		1	" " " " " "
	17	30.03	-8.61	30.13	-8.72	30.25	-12.22	10.5	9.5	87.5	12	88	14.5	12.5	78	SE	oc		2	" " " " " "
	18	30.28	-8.89	30.23	-8.61	30.25	[illegible]	9.5	8	80	10	86	11	9.5	81	SE/S	ocs		2	" " " " " "
	19	30.24	-9.17	30.20	-5.56	30.21	-13.33	10	8	74	11	87	12	10	76	SSE	bc		2	" " " " " "
	20	30.14	-9.72	30.06	-5.44	30.08	-10.00	9	7	73	9.5	76.7	9.5	8.5	76.7	E	bc		2	" " " " " "
	21	29.95	-5.83	29.94	-2.94	29.98	[illegible]	9.5	8	80	12	71	11.5	9.5	75.7	E/N	bc		2	" " " " " "
	22	30.00	-4.72	30.01	-2.39	30.09	[illegible]	9.5	8	80	13	88	16	14	79	E/N	bc		1	" " " " " "
	23	30.13	-4.72	30.11	-4.44	30.11	-8.06	9.5	8	80	13.5	84	16	14	79	SE/E	Oc		1	" " " " " "
	24	29.98	-8.33	29.84	-8.06	29.84	-8.89	9	7	73	14	83.5	15.5	13.5	80	ESE	bc		1	" " " " " "
	25	29.83	-7.78	29.86	-6.11	29.90	-9.44	10	9	86	16	79	18	15	71	"	ocs			" " " " " "
	26	29.96	-3.33	29.96	-1.67	30.01	-7.22	13.5	12	83	17	70	17	14.5	75	Calm	~~ocs~~	B.D	1/10 P.m.	" " " " " "
	27	30.13	-4.44	30.17	-4.17	30.20	-5.56	9.5	8.5	88	[illegible]	86	10	9	86	ESE	bc	1.432	1	" " " " " "
	28	30.20	0	30.12	-1.67	30.07	-3.89	8	7	86	10.5	94	11.5	11	94	Calm	oc		1	" " " " " "
	29	29.82	-1.39	29.88	0	29.90	-0.56	8.6	7	79.5	11.5	84	17	15	76	SSE	oc		1	" " " " " "
	30	29.87	+0.83	29.80	-1.11	29.79	-2.78	9	8	86	13	88	13.5	13	94	SE/E	ocs		1	" " " " " "
	31	29.66	-1.36	29.61	-0.56	29.64	-1.11	10.7	10	91.5	11	94	12.7	12	91.5	SE	ocf		1	" " " " " "
Average		32°	-5.4	[illegible]	[illegible]	[illegible]	[illegible]	9.9	8.9	[illegible]		84.3	13.7	12.2	82	Southerly	12 bc / 15 oc	1.561	1.16	average dry.

Observations for carbonic acid should be made at least once a week, and the air of the berth deck at night or early in the morning should be selected. The results will not be entered unless the observer is certain of their accuracy.
The time and circumstances of observations for carbonic acid and the wetting of the decks *from any cause* will be entered in column of Remarks.
Same instruments to be used in all hygrometric observations.

Barometer. 32°

J M Ambler
Surgeon, U. S. N.

For ascertaining the amount of carbonic acid in the air the following apparatus is supplied:

Two glass jars, cubic capacity marked in cubic centimeters.

India-rubber stoppers, and sheet india rubber to tie over necks of jars.

Glass measure graduated to 60 c. c.

One Mohr's burette, 60 c. c., graduated into tenths.

Glass rods.

Glass bottle of one liter capacity.

Bottle containing papers of crystallized oxalic acid of 2.25 grammes each.

Bottle containing litmus or turmeric paper.

A small bellows, or, in its absence, a Davidson's syringe may be used.

Lime water and distilled water.

Directions: Pettenkofer's method is to be followed. For those not familiar with it the following process, extracted from Wilson's Hand-Book of Hygiene, is recommended:

The analysis depends on the relative alkalinity of lime water before and after it has absorbed the carbonic acid in the sample of air examined. 2.25 grammes of crystallized oxalic acid are dissolved in 1 liter of distilled water; 1 c. c. of this solution exactly neutralizes 1 milligramme of lime, and hence the amount of lime in a given quantity of lime water can be determined by adding the solution of oxalic acid until the point of neutralization is reached. The amount of oxalic acid required for neutralization expresses the alkalinity of the lime water. If the alkalinity of the lime water be known before and after it has absorbed the carbonic acid in the air contained in the glass jar, the difference will give the amount of lime in milligrammes which has united with the carbonic acid, and the amount of the latter is obtained by calculating according to the atomic weights.

The jar should be perfectly clean and dry. The air to be examined is forced into the jar by a pair of bellows, or a bellows-pump may be used. In either case the nozzle should reach the bottom of the jar.

After the jar has been filled, 60 c. c. of lime water are introduced, the mouth of the jar closed by the stopper, and the stopper secured by a tightly-fitting india-rubber cap. The jar is then well shaken so that the lime water is made to thoroughly wash the contained air, and afterward is left to stand at least eight hours and not more than twenty-four; 60 c. c. are introduced in order that 30 may be taken out for analysis.

Thirty cubic centimeters of lime are poured into the graduated glass and its alkalinity determined by the test solution. Then 30 c. c. are taken from the jar and the alkalinity also determined. The difference is doubled to account for the 30 c. c. left in the jar, and the product gives the amount of lime which has combined with the carbonic acid. The amount of the latter is obtained by converting weight into volume according to the atomic weights, and in one sum by the factor .39748+.

The following rule will simplify the calculation: Multiply the difference between the alkalinity of the lime water before and after it has been placed in the jar by 795 and divide this sum by the number of cubic centimeters in the jar, minus 60. The result will be the ratio of carbonic acid per 1,000 volumes.

A correction must be made for temperature as it is above or below the standard of 62° Fahrenheit. As the coefficient of expansion of air is .0020361 for every degree of Fahrenheit, the rule for correction may be stated with sufficient accuracy thus: For every 5° Fahrenheit above 62° add 1 per cent. to the amount of carbonic acid calculated as above, and deduct the same percentage for every 5° below 62°.

The formula for the correction for pressure is as follows:

30 : observed height of bar. : : capacity : z.

The result expressed by z is substituted for the actual capacity of the jar in the calculation for carbonic acid.

Atmospheric Observations on board U. S. S. *Arctic Str Jeannette*, for the month of *June*, 18*80*

Place	Day	Spar deck 7 A.M.	1 P.M.	10 P.M.	Berth deck 10 A.M.	10 P.M.	Wind	Weather	Carbonic acid	No.	Remarks
In the pack	1	29.54 -0.56	29.49 +0.72	29.56 -3.33	9.5 9.5 87.5 12	15 94 9.7 9 90.5	SE/S	O.C.S		1	S.D. snow. B.D. dry.
	2	29.56 -3.33	29.47 -2.50	29.56 0	8 7 86 10.5	0 94 10 10 100	SSE/E	OCS		1	" " wet melting S. " " damp
	3	29.83 -1.67	29.94 44 -0.28	29.99 31 -2.78	8 7.5 92.5 8.5	93 10.8 10 90	W/N	bc		1	" " dry " " damp.
	4	29.90 34 0	29.85 37 2 1.5 91	29.85 37 1 0.5 81.5	8.5 7.5 81 9.5	93.5 10.5 10 94	SSE	OC		1	" " " " " "
	5	29.95 37.5 0.5 0 90	29.93 48 2.5 1.5 91	29.80 30 -3.33	6 5.5 92.5 13.5	13 94 15.5 14 84	NNE	OC		"	" " " " " dry
	6	29.35 35 0.5 0.5 100	29.38 36 0.2 0 96	29.53 27 -3.33	9 8 86 8.5	93 13.5 12.5 88.5	S	bc		1	" " " " "
	7	29.73 28 -3 -4 78	29.77 34 -1.6 -2 71.5	29.77 28 -3.33 -3.89	6.5 6 92.5 6	5 92.5 8.5 7.5 81	NW	bc	2,307	1	10 p.m. SD. " " " " "
	8	29.77 31 -1.94 -2.22 94	29.82 34 -0 -1.11 79	29.85 28 -3.33 -3.33 ×	6.5 6 92.5 8.5	93 10.5 10 94	W	bc		/	" " " " "
	9	29.88 34 -1.5 -2 91	29.85 44 -1 -1.5 91	29.74 27.5 -4 -4.5 89.5	9 8 86 9	5 93 11 10 87	E/S	bc		1	" " " " " "
	10	29.52 33 -2 -2.2 100	29.45 36 -0.2 -0.5	29.42 32.5 -0.56 -0.56 100	10.5 10 94 12.5	2 94 14 13.5 94.5	ENE	OCS		1	S.D. melting snow " " damp.
	11	29.44 39 +1.67 +1.67 100	29.46 37.5 +2.5 +1.5 82	29.56 31.5 -0.5 -0.5 100	11 10.5 94 12	12 100 10 10 100	SE/E	OC		1	" " damp " " "
	12	29.80 31.5 -2.5 -2.5 100	29.67 33 -0.5 -0.5 100	29.74 34 +0.5 +0.5 100	8.5 8 93 14	4 100 13.5 13 94	W	OC			" " wet melting snow " " wet washed
	13	29.87 39.5 +2 +1.5 91	29.82 41 +4.5 +3 75.5	29.74 36 -3.5 -4 93	7.5 7 9 93 11.5	1 94 13 12.5 94	SW/W	bc		1	" " damp " " damp.
	14	29.86 37 0 -0.5 81.5	29.95 36 +0.5 -0.5 85.5	29.95 30 -1.5 -2 90	10 9 86 9.5	93.5 12 11.5 94	W	OC		1	" " " " " "
	15	29.82 31 -1 -1.5 90	29.96 33.5 +2 0 63	30.00 30 -1.3 -1.6 94.5	8.5 8 93 11	15 93.5 11 10.5 93.5	W/N	bc		1	" " dry ☉ " " dry
	16	30.04 29 -2 -2.5 74.5	30.04 35 +.5 0 91	30.05 29.5 -1.5 frozen	10 9.5 93.5 11.5	14 14 13.5 94.5	WNW	bc		1	" " ☉ " " "
	17	30.02 31.5 0 -0.5 81.5	29.70 35 +3 +2 80	29.73 30.5 -1 -1.5 91.5	10 9.5 98.5 9	98 9 8.5 98	SW/W	bc		1	" wet melting snow " " wet
	18	29.40 29 -2.5 -3 90	29.41 37 -3 -3.5 89.5	29.45 31 0 0	8 7.5 92.5 10.5	94 12 11.5 94	SW	bc			" " damp " " dry
	19	29.54 35 +0.8 +0.5	29.62 39 +5 +0.5 74.5	29.65 31 0 -0.5 81.5	9 8.5 93 10	5 93.5 12.5 12 94	NW	OC		1	" " " " " "
	20	29.54 34 +0.5 +0.2	29.37 35 +0.5 +0.5 100	29.22 35 +1.11 +1.11 100	8 7.5 92.5 10.5	100 11 11 100	S	OCR		1	Air saturated snow sleet Rain
	21	29.38 36 +.8 +.5	29.32 38 +1.11 +.8	29.20 34 0 0 100	8 8 100 8.5	93 10.5 10 94	SW/S	OCS	SD 2,495 10 p.m.	1	" " " "
	22	29.32 35 +.5 0 90	29.44 38.5 +5.5 +3.5 64	29.57 32 +1.6 +1.6 100	8.5 8 93 9.5	93.5 12 11.5 94	W/S	bc		1	Deck comparatively dry.
	23	29.67 38.5 +1.5 +1 91	29.67 39 +2.5 +1.5 85	29.60 34 +0.2 0 96	8.5 8 93 10.2	97 13 12.5 94	E	bc		1	" " "
	24	29.50 38 +2 +1.5 91	29.66 37 +2 +1	29.76 33 0.5 0 90	9.5 9 93.5 8.5	93 9 8.5 93	SW/S	O.C.R		1	Both decks wet. Rain.
	25	29.92 42 +4.5 +3.5 77.5	30.00 37 +6 +5 85	30.04 38 +1.5 +1 91	8 7.5 93 10	86 12.2 12 98	NW/N	OC		1	" " dry
	26	30.08 41 +2.2 +2.2 100	30.10 46 +7 +6 85	30.12 36 +1.5 +1 91	11 10 87 14	5 94.5 14.5 14 94	NE/N	OC		1	" decks washed down
	27	30.14 39.5 +2 +1.5 91	30.12 44 +4.5 4 91.5	30.22 37 +2 +1.5 91	8 7 86 10	5 93.5 13.2 13 98	W.	bc		1	" " dry "
	28	30.37 43 +3 +2.5 91.5	30.40 49 +7 +6 85	30.40 39 +2 +1.5 91	9 9 100 10.5	94 11 10.5 93.5	N	OC		1	" " "
	29	30.38 39 +3.3 +2.5 85	30.36 47.5 12.7 10 69	30.06 41 +3.3 +2.5 85	8.5 8 98 10	93.5 11.2 11 97	NW	bc		1	" " "
	30	30.35 43 +3.5 +3 91.5	30.32 44 10 7.5 68	30.27 37 +2 +1.5 91	9.5 9 93.5 9.5	93.5 11.2 10.5 91	ESE	bc	2,4??	1	" " "
Average	31	29.78 35.5 .25 .05 90	29.78 39.5 2.4 1.8 83	29.78 32.8 -.5 -.3 92.5	8.7 8.15 92.2 10.?	94 11.6 11.1 93.0	Westerly	OC 15, bc 15			
Average									2,4210		17 dry 13 wet

Observations for carbonic acid should be made at least once a week, and the air of the berth deck at night or early in the morning should be selected. The results will not be entered unless the observer is certain of their accuracy.
The time and circumstances of observations for carbonic acid and the wetting of the decks *from any cause* will be entered in the column of Remarks.
Same instruments to be used in all hygrometric observations.

J. M. Ambler
P. A. Surgeon, U. S. N.

For ascertaining the amount of carbonic acid in the air the following apparatus is supplied:

Two glass jars, cubic capacity marked in cubic centimeters.

India-rubber stoppers, and sheet india rubber to tie over necks of jars.

Glass measure graduated to 60 c. c.

One Mohr's burette, 60 c. c., graduated into tenths.

Glass rods.

Glass bottle of one liter capacity.

Bottle containing papers of crystallized oxalic acid of 2.25 grammes each.

Bottle containing litmus or turmeric paper.

A small bellows, or, in its absence, a Davidson's syringe may be used.

Lime water and distilled water.

Directions: Pettenkofer's method is to be followed. For those not familiar with it the following process, extracted from Wilson's Hand-Book of Hygiene, is recommended:

The analysis depends on the relative alkalinity of lime water before and after it has absorbed the carbonic acid in the sample of air examined. 2.25 grammes of crystallized oxalic acid are dissolved in 1 liter of distilled water; 1 c. c. of this solution exactly neutralizes 1 milligramme of lime, and hence the amount of lime in a given quantity of lime water can be determined by adding the solution of oxalic acid until the point of neutralization is reached. The amount of oxalic acid required for neutralization expresses the alkalinity of the lime water. If the alkalinity of the lime water be known before and after it has absorbed the carbonic acid in the air contained in the glass jar, the difference will give the amount of lime in milligrammes which has united with the carbonic acid, and the amount of the latter is obtained by calculating according to the atomic weights.

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The following rule will simplify the calculation: Multiply the difference between the alkalinity of the lime water before and after it has been placed in the jar by 795 and divide this sum by the number of cubic centimeters in the jar, minus 60. The result will be the ratio of carbonic acid per 1,000 volumes.

A correction must be made for temperature as it is above or below the standard of 62° Fahrenheit. As the coefficient of expansion of air is .0020361 for every degree of Fahrenheit, the rule for correction may be stated with sufficient accuracy thus: For every 5° Fahrenheit above 62° add 1 per cent. to the amount of carbonic acid calculated as above, and deduct the same percentage for every 5° below 62°.

The formula for the correction for pressure is as follows:

30 : observed height of bar. : : capacity : z.

The result expressed by z is substituted for the actual capacity of the jar in the calculation for carbonic acid.

Atmospheric Observations on board U. S. S Arctic Str Jeannette, for the month of July, 1880.

Place	Date	Spar deck 7 A.M. Barom.	Ther.	Dry	Wet	Rel. hum.	1 P.M. Barom.	Ther.	Dry	Wet	Rel. hum.	10 P.M. Barom.	Ther.	Dry	Wet	Rel. hum.	Berth deck 10 A.M. Dry	Wet	Rel. hum.		Berth deck 10 P.M.	Dry	Wet	Rel. hum.	Wind	Weather	Carbonic acid	Average number of ship's company. No.	Remarks
In the pack	1	30.16	39	3	2	83	30.12	39	10.5	9	81	30.08	37	2.5	2	91	9.5	9	96	8	98	9.8	9	87.5	SE	bc		1	Both decks dry.
	2	30.00	42	5	4	84	29.94	52	2.5	21	95	29.84	42.5	3.5	3	83.5	7.5	[illegible]	92.5	8.8	89	13	12.5	94	S	bc		1	" " "
	3	29.69	45.5	4.4	4.4	100	29.67	60	14.5	11.5	67.5	29.66	44	4.5	4	91.5	9	8.5	[illegible]	8	98	10.2	10	97	calm	bc		1	Both decks washed down
	4	29.71	45	5.5	4.5	80	29.74	49	5.5	5	95.5	29.74	37.5	1	+.5	90.5	8.7	8	[illegible]	12	[illegible]	18	12.5	94	NE/N	of.		1	" " dry.
	5	29.70	41	2.5	2	91	29.68	41.5	3	2.5	91.5	29.68	36	1.5	1	91	10.2	10	97	11.5	94	13.2	13	98	E	oc		1	" " "
	6	29.64	39.5	3	2.5	91.5	29.61	42	3.5	3	91.5	29.57	35	1.3	1	94.5	10.3	10	96	10.8	90	14	13.5	94.5	E	ocr		1	Spar .. damp. Rain. B.D. dry.
	7	29.50	37	1.94	1.94	100	29.51	38.5	3.3	3	95	29.54	36	1.9	1.6		13	13	100	13.8	[illegible]	13.2	13	98	SE/E	ocr		1	" " " " "
	8	29.62	41	4.5	4	91.5	29.63	42	5	4.5	92	29.63	38.5	2.5	2	94.5	13.2	13	98	9.5	96	11.5	11	94	NW	bc		1	Both decks dry.
	9	29.43	37.5	2	1.5	91	29.43	39	4	2.5	74.5	29.54	35	1.11	1.11	100	9.5	9	96	8.5	98	10.2	10	97	SW/W	bc		1	" " "
	10	29.68	35.5	1.11	1.11	100	29.48	34.5	0.5	0.5	100	29.48	36	1.11	1.11	100	7.5	7.5	100	8	100	12	12	100	SW/S	oc. Rain	B.D. 10 P.M. 1852	1	Spar deck washed up. B deck washed.
	11	29.58	39	2	1.5	91	29.58	44	8.5	7	79.5	29.54	39	2.5	2	91	9.5	9	96	11.5	94	15	14	89	E	oc		1	Both decks dry.
	12	29.56	44	5.5	5	95.5	29.58	50.5	16	8	24	29.59	39	2.5	2	91	10	9.5	93	8.5	98	12	11.5	94	E	bc		1	" " "
	13	29.60	44	5	4.5	92	29.61	46.5	10	8	74	29.65	36.5	2.2	2.2	100	9.5	9	96	9.8	[illegible]	11.5	11	94	SE/E	bc		1	" " "
	14	[illegible]	37	2	1.5	91	29.96	39	3.5	2.5	83	29.98	34	.5	0	90	7	6.5	92.5	8	[illegible]	11.2	11	[illegible]	W	ocf		1	Spar deck damp. B deck dry.
	15	29.95	41	3.5	3	91.5	29.84	37	2	1	82	29.77	37	.5	.5	100	7.5	7	92.5	9.5	94	10.2	10	97	SW/S	bc.-R.P.M.		1	Wet from rain.
	16	29.76	35	1	.5	90.5	29.74	35	1	.5	90.5	29.72	33	.2	.0	96	6.5	6	92.5	9.5	96	10	9.5	93	W/N	bc		1	Spar deck damp R at night. B.d. dry.
	17	29.42	35	1.3	1.3	100	29.31	34.5	1	.5	91.5	29.56	33	.2	.2	100	10.2	10	97	6.2	[illegible]	15	14	89	SE	oc. Sn. R.P.M	B.D. 11 P.M.		Spardeck washed down. B.D. washed.
	18	29.78	35	.8	.5		29.78	37	2.2	0	78	29.78	33	.2	0	96	9	8.5	93	[illegible]	94	13.5	13	94	W/N	o.c. S.P.M.	2.708	1	Both decks damp.
	19	29.79	35	.2	0	96	29.74	39	3	2	[illegible]	29.45	33	.5	0	90	10	9.5	93	10	97	12.5	12	94	"	oc m		1	" " dry.
	20	29.42	36	1.5	1	91	29.42	44	4.5	3.5	88.5	29.44	36	1.5	1	91	10.5	10	94	10.5	94	12	11.5	94	E.S.E	oc		1	S Deck wet rain. B.D. dry.
	21	29.38	34	1.5	1	91	29.47	34	4	3	83	29.31	33	0	-.5	90.5	9.5	9	93.5	[illegible]	97	11	11.5	93.5	W/S	oc 5 P.M. m		1	" " " " " "
	22	29.52	35.5	.5	.5	100	29.59	36.5	2	1.5	91	29.62	33	.5	.5	100	7.5	7	92.5	7.5	92.5	9.5	9	93.5	W	ocs		1	S. " " " melting snow. " " "
	23	29.66	33.5	0	0	100	29.67	35	3.5	1.5		29.64	31	-.5	-.8		8.5	8	92.5	10	93	10.5	10	94	W/N	bc		1	" " " " " " " "
	24	29.55	33	0	-.5	90.5	29.56	33	.5	0	90	29.60	32	0			6.5	6.5	10	16	[illegible]	14.8	14	[illegible]	W/S	oc		1	S deck dry B.d. washed down
	25	29.47	35	1.5	.5	81.7	29.48	35	1	.5	90.5	29.60	30	0			8	7	[illegible]	7.5	92.5	11	10.5	93.5	W	bc. S.P.M		1	" " wet melting snow B.d. dry. B deck 10 P.M.
	26	29.59	36	1.3	1.3	100	29.64	41	3	2.5	91.5	29.69	30	0	-.5	90.5	9	8.5	93	11.2	97	12.2	12	98	SW/W	oc	368	1	" " " " " " "
	27	29.74	33	.5	0	90	29.72	35	1.3	.5	[illegible]	29.70	31.5	-.8	-1.11		10	9.5	93	[illegible]	97	12.2	12	92	W	ocs		1	" " " " "
	28	29.57	34	-.5	-.8		29.48	35	.5	0	90	29.32	34	1	.5	90.5	9	8.5	93	8	93	10.2	10	97	SW/S	oc		1	" " dry " "
	29	29.34	37	.2	0	96	29.44	38	1.3	.5	88.5	29.50	32	-.2	-.5		7.5	7	92.5	9	93	9	8.5	93	S/W	bc		1	" " damp " "
	30	29.53	37.5	2.2	1.5	87.5	29.53	36	1.5	.5	81.7	29.54	33	0	0	100	7	6.5	92.5	8	93	8.5	8	92.5	S/W	oc. S P.M.	[illegible]	1	S D. wet from melting snow.
	31	29.65	35.5	.5	.5	100	29.68	36	.5	.2		29.70	33	-.5	-.5	100	6.5	6	92.5	11	94	10.5	10	94	SSW	bc. s	2.088	1	Both decks washed.
Average		29.65	37.4	2	1.5	92.8	29.64	40.1	4.5	3.4	80.9	29.63	35	1	0.76	90.1	8.9	8.5	94.1	[illegible]	95	11.7	11.2	94.3	Southerly	oc	2.637	1	wet

Observations for carbonic acid should be made at least once a week, and the air of the berth deck at night or early in the morning should be selected. The results will not be entered unless the observer is certain of their accuracy.
The time and circumstances of observations for carbonic acid and the wetting of the decks *from any cause* will be entered in column of Remarks.
Same instruments to be used in all hygrometric observations.

[illegible signature]
Surgeon, U. S. N.

For ascertaining the amount of carbonic acid in the air the following apparatus is supplied:

Two glass jars, cubic capacity marked in cubic centimeters.

India-rubber stoppers, and sheet india rubber to tie over necks of jars.

Glass measure graduated to 60 c. c.

One Mohr's burette, 60 c. c., graduated into tenths.

Glass rods.

Glass bottle of one liter capacity.

Bottle containing papers of crystallized oxalic acid of 2.25 grammes each.

Bottle containing litmus or turmeric paper.

A small bellows, or, in its absence, a Davidson's syringe may be used.

Lime water and distilled water.

Directions: Pettenkofer's method is to be followed. For those not familiar with it the following process, extracted from Wilson's Hand-Book of Hygiene, is recommended:

The analysis depends on the relative alkalinity of lime water before and after it has absorbed the carbonic acid in the sample of air examined. 2.25 grammes of crystallized oxalic acid are dissolved in 1 liter of distilled water; 1 c. c. of this solution exactly neutralizes 1 milligramme of lime, and hence the amount of lime in a given quantity of lime water can be determined by adding the solution of oxalic acid until the point of neutralization is reached. The amount of oxalic acid required for neutralization expresses the alkalinity of the lime water. If the alkalinity of the lime water be known before and after it has absorbed the carbonic acid in the air contained in the glass jar, the difference will give the amount of lime in milligrammes which has united with the carbonic acid, and the amount of the latter is obtained by calculating according to the atomic weights.

The jar should be perfectly clean and dry. The air to be examined is forced into the jar by a pair of bellows, or a bellows-pump may be used. In either case the nozzle should reach the bottom of the jar.

After the jar has been filled, 60 c. c. of lime water are introduced, the mouth of the jar closed by the stopper, and the stopper secured by a tightly-fitting india-rubber cap. The jar is then well shaken so that the lime water is made to thoroughly wash the contained air, and afterward is left to stand at least eight hours and not more than twenty-four; 60 c. c. are introduced in order that 30 may be taken out for analysis.

Thirty cubic centimeters of lime are poured into the graduated glass and its alkalinity determined by the test solution. Then 30 c. c. are taken from the jar and the alkalinity also determined. The difference is doubled to account for the 30 c. c. left in the jar, and the product gives the amount of lime which has combined with the carbonic acid. The amount of the latter is obtained by converting weight into volume according to the atomic weights, and in one sum by the factor .39748+.

The following rule will simplify the calculation: Multiply the difference between the alkalinity of the lime water before and after it has been placed in the jar by 795 and divide this sum by the number of cubic centimeters in the jar, minus 60. The result will be the ratio of carbonic acid per 1,000 volumes.

A correction must be made for temperature as it is above or below the standard of 62° Fahrenheit. As the coefficient of expansion of air is .0020361 for every degree of Fahrenheit, the rule for correction may be stated with sufficient accuracy thus: For every 5° Fahrenheit above 62° add 1 per cent. to the amount of carbonic acid calculated as above, and deduct the same percentage for every 5° below 62°.

The formula for the correction for pressure is as follows:

30 : observed height of bar. : : capacity : z.

The result expressed by z is substituted for the actual capacity of the jar in the calculation for carbonic acid.

Atmospheric Observations on board U. S. S *Arctic Str Jeannette*, for the month of *August*, 1880.

Place	Date	Spar deck 10 A.M. Bar.	Ther.	Dry bulb	Wet bulb	Relative humidity	4 P.M. Bar.	Ther.	Dry bulb	Wet bulb	Relative humidity	10 P.M. Bar.	Attached Ther.	Dry bulb	Wet bulb	Relative humidity	Berth deck 10 A.M. Dry bulb	Wet bulb	R.	D.	R.	10 P.M. Dry bulb	Wet bulb	Relative humidity	Wind	Weather	Carbonic acid	Average number of ship's company No.	Remarks
In the pack	1	29.66	35.5	3	2.5	91.5	29.60	38	2.5	2	91	29.60	33	-.5	0	90	6.5	6	92.5	5.5	9.5	7.5	7	93.5	S	ocs	Berth deck 10 P.M.	1	Spardeck wet Berth deck dry.
	2	29.61	35	.5	0	90	29.62	38	3	2	83	29.62	29.5	-2	-2		5	4.5	92	6.5	92.5	7	6.5	92.5	W/N	ocs		1	" " dry " " "
	3	29.64	32	-0.5	-1.5	100	29.22	35	1.11	1.11	100	29.21	34.5	-.8	-.8	100	6	5.5	92.5	7	92.5	7.5	7	93	SSE	ocs		1	" " wet " " "
	4	29.16	35	comet -1.11	-1.11	100	29.30	37	+2	+1.5	91	29.22	31	-1	-1.5	100	6.5	6	92.5	8.5	[illegible]	9	8.5	[illegible]	WSW	ocf		1	" " " " " "
	5	29.43	35	.5	0	90	29.47	33	0	-.5	90.5	29.52	31	-.8	-1		7	6.5	92.5	9.5	93.5	10.5	10	94	SW	ocs		1	Both decks dry.
	6	29.57	35	0	0		29.60	37	1.8	1.6		29.59	32	-.2	-.8		8	7.5	93	9	93	9.5	9	93.5	S	oc	1.959	1	" " "
	7	29.52	37	1.5	1	91	29.58	35	.8	.8	100	29.74	35	-0.5	-0.5	100	6.2	6	97	15	88.5	13.5	12.5	88.5	S	oc, R P.M.		1	Spar deck wet rain, B.d. washed up
	8	29.96	36	0	-.5	90.5	29.99	36	-0.2	-0.8		29.99	29	-3.06	-3.06		8	7	86	9	93	10	9.5	93	NW/N	oc, mist		1	" " damp " " dry
	9	~~29.92~~	30	-1	-1.5	90	29.84	36	0	-.5	90.5	29.79	31	-1.11	-1.11	100	7.2	7	97	9.5	93.5	11	10.5	93.5	NE	oc, R P.M.		1	" " dry a.m. " " "
	10	29.68	35	.8	.5		29.65	38	1.5	.5	81.7	29.63	35	-0.2	-0.2	100	10	9.5	93	12.5	94	12.5	12	94	N	oc, R, mist	Berth deck 10 P.M.	1	" " wet " " "
	11	29.76	41	0	-0.2		29.73	39	2	1	82	29.70	35	1	.5	90.5	8.5	8	93	10.2	97	11.5	11	94	N	oc		1	" " damp " " "
	12	29.74	40	1.5	1	91	29.88	35	1.3	1	94.5	29.98	29.5	-1.5	-2	90	5.5	5	92.5	7	92.5	9	8.5	93	WNW	bc, S P.M.		1	" " dry " " "
	13	30.04	41	-.5	-1	90.5	30.08	42	3	2	83	30.04	35	0.5	0	90	6.2	5.5	89.5	8.2	97	10.5	10	94	SSE	bc		1	" " " " " "
	14	29.90	37.5	1.3	1.3	[illegible]	29.86	38	1.1	1.1	100	29.88	35	0.8	0.8	100	10	10	100	19	89.5	15.5	15	94	NNE	oc, mist, R	1.829	1	Both decks washed up.
	15	29.88	39	2.2	2.2	100	29.82	39	3	2.5	91.5	29.83	35	1.1	1.1	100	9.5	9	93.5	12.2	98	11.2	11	97	NNE	oc " "		1	S. deck wet B deck damp
	16	29.82	37	1.5	1.5	100	29.81	35	1	1	100	29.82	33.5	0.5	0.5	100	8.2	8	97	8.5	93.5	11	11	100	NE/E	ocmR		1	" " " "
	17	29.78	36	1	1	100	29.73	36	1.3	1.3	100	29.72	34.5	0.5	0.5	100	9	8.5	93	10.2	97	11.2	11	97	N/E	ocf		1	" " " " " "
	18						29.78	41	3.3	3.3	100	29.80	36	1.3	1.3	100				10	100	12	12	100	Calm	ocf	B.D. 10 A.M.	1	" " " " " "
	19	29.82	42	3.3	3	95	29.84	42	3.5	3.3		29.86	37	1.5	1.5	100	10	9.5	93	11	93.5	10.5	10.5	100	Calm	oc		1	" " dry " " dry
	20	29.94	45	2.5	2	91	29.95	45	4.1	3.8		29.95	38	1.1	1.1	100	10.2	10	97	11	93.5	12.5	12.5	100	~~[illegible]~~	oc		1	" " " " " "
	21	30.00	44.5	2.7	2.7	100	30.01	40	2.5	2.5	100	30.06	36	1.1	1.1	100	11.5	11.5	100	14	100	14	13.5	94.5	N W	oc	3.5	1	Both decks washed up [illegible] 8 am
	22	30.14	36	0.8	0.8	100	30.17	36	1.3	1.3	100	30.18	35.5	0.8	0.8	100	9	8.5	93	11.2	97	12.2	12	97	Calm	oc	2.05	1	" " damp.
	23	30.16	36.5	1.3	1.3	100	30.12	39	2.5	2.5	100	30.10	36	1.1	1.1	100	10	9.5	93.5	11	93.5	11.5	11	94	NE	ocf		1	S deck wet B deck damp
	24	30.04	38	2.5	2	91	30.02	39	2.5	2	91	30.01	35	1.1	1.1	100	11	10.5	93.5	11.2	97	12.2	12	97	N/E	ocm		1	S deck damp " " "
	25	30.04	36.5	1.5	1	91	30.05	35	1	0.8	90.5	30.06	34	0.2	0.2	100	10.5	10	94	9.5	93.5	11.5	11.5	100	NNE	ocm		1	" " " " " "
	26	30.03	35	0.8	0.8	100	29.99	35	1.1	1.1	100	29.98	35	0.8	0.8	100	10.2	10	97	11	100	11	11	100	NE	ocm	B.D. 10 P.M.	1	" " " " " "
	27	29.92	36	1.5	1.5	100	29.86	37	1.3	1.0	94	29.82	35	1.0	0.5	90.5	9	9	100	18	85	20	18.5	86	NE	ocmf		1	S " wet " " "
	28	29.81	36	1.5	1.5	100	29.84	38	1.5	1.5	100	29.90	34	0.2	0.2	100	10.5	10	94	12.5	[illegible]	14	13.5	94.5	NE/E	ocf		1	Both decks washed up.
	29	29.98	36	0.8	0.5	91	29.99	36	1.5	1.5	100	30.00	34	0.5	0.5	100	12	11.5	94	16	94	16.5	15	84	ESE	ocf	2.07	1	S deck [illegible] B.d. damp
	30	29.96	35	0.5	0.5	100	29.94	36	1.1	0.8		29.90	32	-1.1	-1.1	100	11	10	8	13	[illegible]	13	12.5	94	SE/S	ocfm		1	" " wet " " "
	31	29.88	67	1.3	1.0	94.5	29.82	41	3.0	2.5	91	29.78	32	-1.0	-1.0	~~100~~	9.5	9	93.5	9.5	93.5	10.5	10	94	"	fc		1	S wet melting ice. B.d. dry.
Average		29.754	38	1.3	1.1	95.5	29.84	37.4	1.4	1.4	94	29.82	34.3	.31	.06	98	9.3	8.8	93.2	11	11	11.6	11.2	94.5	Northerly	cloudy	1.8754	1	Spar deck wet. B.D. damp.

Observations for carbonic acid should be made at least once a week, and the air of the berth deck at night or early in the morning should be selected. The results will not be entered unless the observer is certain of their accuracy.
The time and circumstances of observations for carbonic acid and the wetting of the decks *from any cause* will be entered in column of Remarks.
Same instruments to be used in all hygrometric observations.

For ascertaining the amount of carbonic acid in the air the following apparatus is supplied:

Two glass jars, cubic capacity marked in cubic centimeters.

India-rubber stoppers, and sheet india rubber to tie over necks of jars.

Glass measure graduated to 60 c. c.

One Mohr's burette, 60 c. c., graduated into tenths.

Glass rods.

Glass bottle of one liter capacity.

Bottle containing papers of crystallized oxalic acid of 2.25 grammes each.

Bottle containing litmus or turmeric paper.

A small bellows, or, in its absence, a Davidson's syringe may be used.

Lime water and distilled water.

Directions: Pettenkofer's method is to be followed. For those not familiar with it the following process, extracted from Wilson's Hand-Book of Hygiene, is recommended:

The analysis depends on the relative alkalinity of lime water before and after it has absorbed the carbonic acid in the sample of air examined. 2.25 grammes of crystallized oxalic acid are dissolved in 1 liter of distilled water; 1 c. c. of this solution exactly neutralizes 1 milligramme of lime, and hence the amount of lime in a given quantity of lime water can be determined by adding the solution of oxalic acid until the point of neutralization is reached. The amount of oxalic acid required for neutralization expresses the alkalinity of the lime water. If the alkalinity of the lime water be known before and after it has absorbed the carbonic acid in the air contained in the glass jar, the difference will give the amount of lime in milligrammes which has united with the carbonic acid, and the amount of the latter is obtained by calculating according to the atomic weights.

The jar should be perfectly clean and dry. The air to be examined is forced into the jar by a pair of bellows, or a bellows-pump may be used. In either case the nozzle should reach the bottom of the jar.

After the jar has been filled, 60 c. c. of lime water are introduced, the mouth of the jar closed by the stopper, and the stopper secured by a tightly-fitting india-rubber cap. The jar is then well shaken so that the lime water is made to thoroughly wash the contained air, and afterward is left to stand at least eight hours and not more than twenty-four; 60 c. c. are introduced in order that 30 may be taken out for analysis.

Thirty cubic centimeters of lime are poured into the graduated glass and its alkalinity determined by the test solution. Then 30 c. c. are taken from the jar and the alkalinity also determined. The difference is doubled to account for the 30 c. c. left in the jar, and the product gives the amount of lime which has combined with the carbonic acid. The amount of the latter is obtained by converting weight into volume according to the atomic weights, and in one sum by the factor .39748+.

The following rule will simplify the calculation: Multiply the difference between the alkalinity of the lime water before and after it has been placed in the jar by 795 and divide this sum by the number of cubic centimeters in the jar, minus 60. The result will be the ratio of carbonic acid per 1,000 volumes.

A correction must be made for temperature as it is above or below the standard of 62° Fahrenheit. As the coefficient of expansion of air is .0020361 for every degree of Fahrenheit, the rule for correction may be stated with sufficient accuracy thus: For every 5° Fahrenheit above 62° add 1 per cent. to the amount of carbonic acid calculated as above, and deduct the same percentage for every 5° below 62°.

The formula for the correction for pressure is as follows:

30 : observed height of bar. : : capacity : z.

The result expressed by z is substituted for the actual capacity of the jar in the calculation for carbonic acid.

Atmospheric Observations on board U. S. S Arctic Str Jeannette, for the month of September, 1880.

Place	Day	Spar deck 10 A.M.	Spar deck 1 P.M.	Spar deck 10 P.M.	Berth deck 10 A.M.	Berth deck 10 P.M.	Wind	Weather	Carbonic acid	Number of sick	Remarks
In the pack	1	29.72 58 2.5 1.5 82	29.74 34 0.8 0.8 100	29.74 32 -1.0 -1.5 80	8.5 8 93 8.5	93 10.5 10. 94	Clm	bc		1	Spar deck damp. Berth deck dry.
	2	29.68 37 0.5 0.5 100	29.69 33 -0.5 -0.5 100	29.73 30 -1.5 -1.5 100	9.5 9 93.5 8.0	93 10.0 9.5 93	SE	ocs	Berth deck 10 P.M.	1	" " wet " " damp
73° 52' N Lat 174° 31' W Long	3	29.84 36.5 0.2 -0.2	29.86 47 -0.5 -0.8	29.86 49.5 0.0 -0.5 90.5	7.5 7 92.5 7.5	92.5 11.0 10.5 93.5	N	ocs		1	" " " " " "
	4	29.92 49 -0.5 -0.5 100	29.93 53 -1.0 -1.5 90	29.91 57.5 -2.5 -2.8	8.0 7.5 93 18.5	90 15.0 14.5 94.5	N	oc.s		1	Both decks [illegible] up.
	5	29.90 51 -1.5 -2.0 90	29.91 47 -1.0 -1.5 90	29.94 42.5 -2.0 -2.5 74	7.0 6.5 92.5 11.0	93.5 12.0 11.5 94.0	N/W	bc. S. P.M.	1.63	1	" " damp.
73° 41' N Lat 177° 12' W Long	6	30.01 48.5 -1.0 -2.0 80	30.01 47.5 -1.0 -1.0 100 frozen	29.96 47 -6.0 -6.0 frozen	9.0 8.0 86 8.0	93 9.0 8.5 93.0	N	oc bc s		1	Spar deck damp. Condensation on beams 1 Berth deck.
	7	29.93 45.5 -1.0 -1.5 90	30.05 44.5 -3.3 -3.3 100 frozen	30.17 54.5 -6.0 -6.0	6.5 6.0 92.5 13.0	88 14 13.5 94.5	N	bc. s.		1	" " melting snow. B.D. damp.
	8	30.08 47.5 -4.4 -6.0 26	29.95 44 -4.4	29.84 52 -4.4 frozen	5.5 5.0 92.5 12.0	87 12 11.5 94.0	SSE	bc		1	Snow on Spar deck. " " "
	9	29.70 47.5 -0.2 -0.2 100	29.68 47 +0.8 +0.8 100	29.72 50 0.0 0.0 100.	9.2 9.0 97 11.0	93 12.5 12.5 100.0	SSW	ocf. R.		1	Spar deck wet rain " " "
73° 40' 15" N Lat 176° 55' 30" W Long	10	29.76 47 0.0 -0.2	29.88 47 +0.2 0.0 96	29.98 48 -5.2 frozen	9.5 9.0 93.5 10.0	93 12. 12 100	NNW	bc-s		1	" " melting snow " " "
	11	29.82 45.5 -1.5 -2.0 90	29.76 45.5 +0.5 +0.0 90	29.78 56 -0.5 -0.5 100	8.0 7.5 93 17.5	95 12.5 12.5 100	SW	oc. R. s.	1.902	1	" " " " Berth deck washed.
	12	29.72 50.5 -0.2 -0.2 100	29.63 51 0.0 -0.2	29.54 50.5 -1.5 -1.5 100	7.8 7.0 89 11.2	97 13.0 12.5 94.3	S	of. R. S.		1	" " " " " damp.
73° 40' 30" N Lat 176° 30' 40" W Long	13	29.45 47.5 -1.3 -1.3 100	29.46 46 -0.8 -1.0 96	29.49 48 -4.4 -4.7	8.5 8.5 100 9.0	93 11.0 10.5 93.5	SW	bc		1	Both decks damp
	14	29.47 44.5 -5.5 -6.0 87.5	29.45 44.5 -4.3 -4.7	29.37 44.5 -8.8 frozen	7.0 6.5 92.5 7.5	92.5 10.0 9.5 93.0	WSW	bc		1	" " dry
	15	29.16 40.0 -6.0 frozen	29.28 47.0 -7.5 frozen	29.45 51.5 -11.0 frozen	6.0 5.5 92.5 13.5	95.5 12.0 11.5 94.0	NE/N	ocs		1	Snow on Spar deck. Berth dry.
73° 36' N Lat 176° 42' W Long	16	29.55 48 -10.0 frozen	29.58 48 -9.4 " "	29.63 50.5 -12.0 " "	9.0 7.5 79.5 15.5	94.5 13.5 12.5 88.5	NW/N	bc		1	Both decks dry.
73° 30' N Lat 176° 33' W Long	17	29.69 49 -12 " "	29.65 51 -8.5 " "	29.57 54 -9.5 " "	9.0 8.5 93 18.5	83 13.5 12.5 88.5	SW	bc		1	Spar deck dry. Berth deck damp, condensation.
73° 31' 45" N Lat 176° 37' 15" W Long	18	29.46 59 -7 -7.5 86.5	29.42 52 -6.0 -6.3	29.55 55 -13.5	7.0 6.5 92.5 16.	84 14. 13 89	SW	oc	Berth deck 10 P.M.	1	" " " " " [illegible].
	19	29.77 55 -7	29.83 56 -7.0	29.85 57 -8.5	7.0 6.5 92.5 8.	93 9.5 9. 93.5	WSW	bc	3.028	1	Both dry.
73° 31' N Lat 176° 56' W Long	20	29.92 54 -7.7	29.95 53 -8.0	29.94 56.5 9.5	11.5 10.5 87.2 15	83.5 14.5 13.5 88.5	N/E	oc		1	Spar deck dry. B deck damp.
73° 24' 35" N Lat 176° 53' 45" W Long	21	30.05 53 -10.0	30.06 52.5 -11.0	30.05 54.5 -15.0	12 10.5 82. 14.5	88 14. 13 89	N.W	bc		1	Both dry.
73° 23' N Lat 176° 37' W Long	22	30.03 52.5 -10	30.03 49.5 -7.5	30.06 54.5 -6.5	11 9.5 82 12.5	86 13.5 12.5 88.5	Clm	bc		1	" "
73° 25' N Lat 176° 40' 15" W Long	23	30.07 52.5 -4.5	30.05 54 -6.5	30.02 54.5 -8.5	12 11.0 88 13	88 14. 12.5 83.5	NE	oc		1	" "
	24	29.98 51 -9.5	29.93 49 -7	29.92 55 -8.5	10.5 9.5 87.5 10	93 12.5 11.5 86.	E	oc	Berth deck [illegible]	1	" "
	25	29.93 53.5 -5.5	29.63 54.5 -7	29.56 54.5 -5.5	7.5 7 92.5 [illegible]	94 15.5 14 84	NNE	oc		1	Snow on spar deck. B deck. washed up.
	26	29.67 54. -4.4	29.76 52 -0.8	29.74 55. -7.0	10. 9.5 93 [illegible]	79 15 14 89	E	oc	3.515	1	" " " " " " dry.
	27	29.91 54.5 -7.5	29.91 [illegible] -4.5	29.95 55 -7.0	11.5 10.5 87.2 14.5	88 15 14 89	NE	oc			" " " " " " "
	28	30.04 55 -3.	30.03 55.5 -3.5	30.04 57 -5	7 6.5 92.5 11.	86 12 11 88	ENE	oc		1	" " " "
	29	30.08 54 -10.5	30.06 53 -11.5	30.08 56.5 -10.5	7.5 6.5 85.5 10	86 13.5 12 85.5	NNE	oc		1	" " " " "
	30	30.03 53 -15.	30.00 49 -15	30.02 55 -15.5	5 4 84 [illegible]	83 10.5 9 81	NNE	oc		1	" " " " "
	31										
		29.76 49.6 -4.7 -1.7 87 (15th 13)	29.8[illegible] 48.7 -4.6 -1.5	29.82 51.5 1.4 -2.4 92.2	8.4 7.7 9[illegible]	88.9 12.5 11.4 91.2	variable	19 oc 11 bc	2.519	1	Average damp

Observations for carbonic acid should be made at least once a week, and the air of the berth deck at night or early in [the morning] should be selected. The results will not be entered unless the observer is certain of their accuracy.
The time and circumstances of observations for carbonic acid and the wetting of the decks *from any cause* will be en[tered in the column] of Remarks.
Same instruments to be used in all hygrometric observations.

Surgeon, U. S. N.

For ascertaining the amount of carbonic acid in the air the following apparatus is supplied:

Two glass jars, cubic capacity marked in cubic centimeters.

India-rubber stoppers, and sheet india rubber to tie over necks of jars.

Glass measure graduated to 60 c. c.

One Mohr's burette, 60 c. c., graduated into tenths.

Glass rods.

Glass bottle of one liter capacity.

Bottle containing papers of crystallized oxalic acid of 2.25 grammes each.

Bottle containing litmus or turmeric paper.

A small bellows, or, in its absence, a Davidson's syringe may be used.

Lime water and distilled water.

Directions: Pettenkofer's method is to be followed. For those not familiar with it the following process, extracted from Wilson's Hand-Book of Hygiene, is recommended:

The analysis depends on the relative alkalinity of lime water before and after it has absorbed the carbonic acid in the sample of air examined. 2.25 grammes of crystallized oxalic acid are dissolved in 1 liter of distilled water; 1 c. c. of this solution exactly neutralizes 1 milligramme of lime, and hence the amount of lime in a given quantity of lime water can be determined by adding the solution of oxalic acid until the point of neutralization is reached. The amount of oxalic acid required for neutralization expresses the alkalinity of the lime water. If the alkalinity of the lime water be known before and after it has absorbed the carbonic acid in the air contained in the glass jar, the difference will give the amount of lime in milligrammes which has united with the carbonic acid, and the amount of the latter is obtained by calculating according to the atomic weights.

The jar should be perfectly clean and dry. The air to be examined is forced into the jar by a pair of bellows, or a bellows-pump may be used. In either case the nozzle should reach the bottom of the jar.

After the jar has been filled, 60 c. c. of lime water are introduced, the mouth of the jar closed by the stopper, and the stopper secured by a tightly-fitting india-rubber cap. The jar is then well shaken so that the lime water is made to thoroughly wash the contained air, and afterward is left to stand at least eight hours and not more than twenty-four: 60 c. c. are introduced in order that 30 may be taken out for analysis.

Thirty cubic centimeters of lime are poured into the graduated glass and its alkalinity determined by the test solution. Then 30 c. c. are taken from the jar and the alkalinity also determined. The difference is doubled to account for the 30 c. c. left in the jar, and the product gives the amount of lime which has combined with the carbonic acid. The amount of the latter is obtained by converting weight into volume according to the atomic weights, and in one sum by the factor .39748+.

The following rule will simplify the calculation: Multiply the difference between the alkalinity of the lime water before and after it has been placed in the jar by 795 and divide this sum by the number of cubic centimeters in the jar, minus 60. The result will be the ratio of carbonic acid per 1,000 volumes.

A correction must be made for temperature as it is above or below the standard of 62° Fahrenheit. As the coefficient of expansion of air is .00203361 for every degree of Fahrenheit, the rule for correction may be stated with sufficient accuracy thus: For every 5° Fahrenheit above 62° add 1 per cent. to the amount of carbonic acid calculated as above, and deduct the same percentage for every 5° below 62°.

The formula for the correction for pressure is as follows:

30 : observed height of bar. : : capacity : z.

The result expressed by z is substituted for the actual capacity of the jar in the calculation for carbonic acid.

Atmospheric Observations on board U. S. S. Arctic Str Jeannette, for the month of October, 18 80

Place	Date	Spar deck 10 A.M. Barometer	Attached Thermometer	Dry-bulb	Spar deck 1 P.M. Barometer	Attached Thermometer	Dry-bulb	Spar deck 10 P.M. Barometer	Attached Thermometer	Dry-bulb	Berth deck Dry-bulb	Wet-bulb	Relative humidity	Dry-bulb	Wet-bulb	Relative humidity	Dry-bulb	Wet-bulb	Relative humidity	Wind	Weather	Carbonic acid	No.	Remarks
	1	29.86	49	-11.1	29.78	47	-8.3	29.73	56	-6.5	7	6	85	12.5	1	12	13.5	12.5	90.5	nnw	oc	Berth deck 10 p.m.	1	Both decks dry.
	2	29.67	54.5	7.2	29.66	50.5	-6.5	29.72	55	-7.5	7	6	85	13.5	1	83	14	13.	89	ne	bc		1	" "
73° 41' N Lat 178° 50' W Long	3	29.90	53.5	12.2	29.99	53.5	-10.5	30.06	56	-15.5	9	8	86	11.2	1	85	10	9.5	93	sw/w	bc	2.017	1	" " "
	4	30.16	49	-11.3	30.12	53	-13.5	30.23	56	-16.5	5	3.5	77	9.5		80	11	9.5	81	..	ocs		1	" " "
	5	30.24	50	-15.5	30.25	49	-12.2	30.27	53	-11.5	5.5	4	76.5	8.5		79.5	10.5	9	81	wnw	bc		1	" " "
	6	30.30	50	-10.5	30.30	50	-10.5	30.38	53	-10.	3.5	2	74.5	9	7	73	10.5	9.5	86.2	N	oc		1	" "
	7	30.35	54	-9.1	30.32	50	-9.5	30.30	53	-11	8.5	6.5	72.7	11.5	10	85	11	10	87.	N	ocs	Berth deck open	1	" "
	8	30.15	49.5	-11.	30.11	51	-11.	30.11	52	-11.5	9	7.5	79.5	12	10	82	14.5	13	83	NNW	ocs		1	" " "
	9	30.07	49	-11.5	30.05	51	-11.3	30.07	56	-11	7	5.5	72	12.5	11	88.5	14.5	13	83	nw/w	oc		1	Spar deck dry. Berth deck moist.
	10	30.08	52.5	-11	30.09	52	-11.3	30.10	53	-11.3	7	5.5	72	11.5	10	81.5	14.5	13	83	N	bc		1	Both decks dry.
	11	30.08	55	-12.2	30.07	50	-10.8	30.10	55	-11.1	9.5	8	80	13.5	12	83	15	13	78	E	ocs	3.129	1	" " "
	12	30.11	52	-11	30.14	50	-12.5	30.15	58	-12.8	10	8.5	80	12	11	18	11	10	87	calm	oc		1	" " "
	13	30.21	50	-12.5	30.22	51	-11.5	30.25	55	-12.5	8	7	86	11	10	87	10	9	86	E	oc		1	" " "
	14	30.19	50	-14.4	30.16	46	-12.7	30.13	50	-8.8	6.5	4.5	70.5	11	9	75	12	11	88	E	oc.	Berth deck open	1	" " "
	15	30.23	51	-6.5	30.28	49	-7.2	30.30	53	-12.2	10.5	9	81	12.5	11	82	11	10	87	sw/w	oc		1	" " "
73° 27' N Lat 178° 33' E Long	16	30.30	53	-17.5	30.30	47	-20.0	30.35	53	-20.5	8.5	7.5	86	11.5	10	81.5	10	9	86	wsw	bc		1	Spar deck dry. B.D. washed up
	17	30.44	52	-22.7	30.40	44	-22.2	30.39	52	-24.4	5.5	5	92.5	11	10	87	7.5	6.5	86	w/s	bc	1.9069	1	Both dry.
	18	30.27	48	-17.7	30.25	48	-15.	30.24	53	-13.8	6	5	85	9	8	86	12	12	88	sw/s	ocs		1	" "
	19	30.24	53	-13.5	30.14	53	-15	30.13	53	-16.5	8.5	7	79.5	10.5	9	81	11	10	87	SE/E	bc		1	" "
	20	30.00	52.5	-12.7	29.88	55	-10.5	29.79	53	-9.4	8	6	72	12.5	10	76.5	10.5	9	81.5	E/S	ocs		1	" "
	21	29.88	56	-12.7	30.00	55	-12.2	30.19	57	-16.5	10	8	74	12	10	82	13	12	88	W	oc		1	" "
	22	30.38	57	-11.6	30.41	53	-11.6	30.49	53	-11.	12	10	76	15	13	83.5	14	13	89	sw/w	ocs	Berth deck open	1	" "
	23	30.68	52	-18.8	30.72	52	-21.1	30.73	53	-18.3	10	8	74	14	12	78	14.5	13	83	nw	bc		1	" "
	24	30.55	56	-15	30.42	51	-15	30.30	52	-14.4	9	7	73	12	10	82	10	8.5	80	E/S	bc		1	" "
	25	30.10	49	-22.5	30.02	43	-21.5	30.00	50	-22.2	7.5	5.5	71.5	11	10	87	9	7	73	SE	bc	.9158	1	" "
	26	30.00	54	-20.5	30.07	46	-22.2	30.15	53	-20.5	4.5	3	75.5	11	10	87	9	8	86	E/N	bc		1	" "
	27	30.26	47	-18.8	30.35	57	-18.3	30.42	52	-17.7	7.5	6	78.5	11	10	87	11.5	9	72	N/W	bc		1	" "
	28	30.57	53	-15.5	30.60	50	-20.5	30.59	52	-19.4	9	7	73	15	13	78	11.5	10	81.5	"	"		1	" "
	29	30.58	51	-20.5	30.59	49	-23.8	30.69	52	-25.5	7	6	85	13	11	77	10	8	74	"	"		1	" "
	30	30.71	47.5	-28.5	30.73	52	-21.6	30.70	53.5	-23.3	9.5	8	80	12.5	11	82	11	9.5	81	wnw	"		1	" "
	31	30.62	49.5	-23.3	30.57	52	-22.2	30.50	51	-18.3	5.5	4	76.5	12	10	86	11.5	10	81.5	SE/S	"		1	" "
Average		30.23	51.2	-15	30.22	50	-14.5	30.24	53.7	-15.3	7.7	5.9	78.7	11.7	1	82	11.9	10.2	83.8	variable	bc	1.9921	1	dry deck [illegible]

Observations for carbonic acid should be made at least once a week, and the air of the berth deck at night or early in the morning should be selected. The results will not be entered unless the observer is certain of their accuracy.
The time and circumstances of observations for carbonic acid and the wetting of the decks *from any cause* will be entered in column of Remarks.
Same instruments to be used in all hygrometric observations.

For ascertaining the amount of carbonic acid in the air the following apparatus is supplied:

Two glass jars, cubic capacity marked in cubic centimeters.

India-rubber stoppers, and sheet india rubber to tie over necks of jars.

Glass measure graduated to 60 c. c.

One Mohr's burette, 60 c. c., graduated into tenths.

Glass rods.

Glass bottle of one liter capacity.

Bottle containing papers of crystallized oxalic acid of 2.25 grammes each.

Bottle containing litmus or turmeric paper.

A small bellows, or, in its absence, a Davidson's syringe may be used.

Lime water and distilled water.

Directions: Pettenkofer's method is to be followed. For those not familiar with it the following process, extracted from Wilson's Hand-Book of Hygiene, is recommended:

The analysis depends on the relative alkalinity of lime water before and after it has absorbed the carbonic acid in the sample of air examined. 2.25 grammes of crystallized oxalic acid are dissolved in 1 liter of distilled water; 1 c. c. of this solution exactly neutralizes 1 milligramme of lime, and hence the amount of lime in a given quantity of lime water can be determined by adding the solution of oxalic acid until the point of neutralization is reached. The amount of oxalic acid required for neutralization expresses the alkalinity of the lime water. If the alkalinity of the lime water be known before and after it has absorbed the carbonic acid in the air contained in the glass jar, the difference will give the amount of lime in milligrammes which has united with the carbonic acid, and the amount of the latter is obtained by calculating according to the atomic weights.

The jar should be perfectly clean and dry. The air to be examined is forced into the jar by a pair of bellows, or a bellows-pump may be used. In either case the nozzle should reach the bottom of the jar.

After the jar has been filled, 60 c. c. of lime water are introduced, the mouth of the jar closed by the stopper, and the stopper secured by a tightly-fitting india-rubber cap. The jar is then well shaken so that the lime water is made to thoroughly wash the contained air, and afterward is left to stand at least eight hours and not more than twenty-four; 60 c. c. are introduced in order that 30 may be taken out for analysis.

Thirty cubic centimeters of lime are poured into the graduated glass and its alkalinity determined by the test solution. Then 30 c. c. are taken from the jar and the alkalinity also determined. The difference is doubled to account for the 30 c. c. left in the jar, and the product gives the amount of lime which has combined with the carbonic acid. The amount of the latter is obtained by converting weight into volume according to the atomic weights, and in one sum by the factor .39748+.

The following rule will simplify the calculation: Multiply the difference between the alkalinity of the lime water before and after it has been placed in the jar by 795 and divide this sum by the number of cubic centimeters in the jar, minus 60. The result will be the ratio of carbonic acid per 1,000 volumes.

A correction must be made for temperature as it is above or below the standard of 62° Fahrenheit. As the coefficient of expansion of air is .0020361 for every degree of Fahrenheit, the rule for correction may be stated with sufficient accuracy thus: For every 5° Fahrenheit above 62° add 1 per cent. to the amount of carbonic acid calculated as above, and deduct the same percentage for every 5° below 62°.

The formula for the correction for pressure is as follows:

30 : observed height of bar. : : capacity : z.

The result expressed by z is substituted for the actual capacity of the jar in the calculation for carbonic acid.

Atmospheric Observations on board U. S. S. Arctic Str Jeannette, for the month of November, 18 80

PLACE	DAY	SPAR DECK 1 A. M.	SPAR DECK 1 P. M.	SPAR DECK 10 P. M.	BERTH DECK 10 A. M.	(gutter)	BERTH DECK 10 P. M.	WIND	WEATHER	Carbonic acid	No. (Average number of ship's company)	REMARKS
	1	30.38 54 -18.3	30.37 53 -16.6	30.39 55 -14.4	12 10 76 12.5	76.5	14 12 78	s	bc	1.5106	1	Berth decks dry –
	2	30.26 50 -15.	30.15 51 -12.5	30.18 56 -16.1	16 13 69 12	[illegible]	13.5 12 83	wnw	bcs		1	" " "
73° 44' N Lat 179.57 E Long	3	30.34 51 -19.4	30.38 50 -20.5	30.38 51.5 -26.1	17 15.5 85 15.6	74	13 11.5 82.5	wnw	bc		1	" " "
	4	30.04 45 -13.3	29.89 46 -13.3	29.80 53 -12.5	15 12 66 14.5	73	14 12 79	sw/s	scs		1	" " "
	5	29.77 50 -22.2	29.80 48 -23.3	29.88 53 -28.8	16 14.5 84 15	78	12 10.5 82	wnw	bc		1	" " "
	6	29.92 51 -29.4	29.93 44 -31.1	30.00 52 -29.4	14 12 78 12	82	11.5 10 82	"	bc		1	" " "
	7	30.02 43 -30.5	30.05 45 -[illegible]	30.15 51 -30.5	11 9 75 [illegible]	85	12 10 76	wsw	bc		1	" " "
73° [illegible] N [illegible] W.	8	30.20 43 -28.8	30.9 44 -29.4	30.20 48 -27.7	11.5 9 81 9.5	85	10 9 86	sse	bc	1.064	1	" " "
	9	30.09 48 -27.2	30.05 49 -26.1	30.00 53 -24.4	13.5 11 72 11.5	81	11 10 87	ssE	bc		1	" " "
	10	29.83 49.5 -25.	29.78 48 -26.1	29.[illegible] 51 -24.1	13 11 [illegible] 12	76	11 10 87	nne	bc		1	" " "
	11	29.70 47 -27.7	29.67 46 -28.5	29.65 57 -28.5	13.5 11 72 10	85	12 11 88	n	bc		1	" " "
	12	29.51 45 -28.8	29.46 44 -30.	29.50 53 -27.7	8.5 7 80 9.5	60.5	10 8.5 80	n	bc		1	" " "
	13	29.69 49 -24.6	29.75 49.5 -24	29.79 54 -23.3	10 8 [illegible] 9	73	9 8 86	sE	bc			" " "
	14	29.70 50 -24.4	29.90 49 -27.7	30.03 51 -29.4	11 9 75 12	82	13.5 12 83	sw/w	bc		1	" " "
	15	30.45 49 -27.7	30.66 46 -27.7	30.92 50 -29.4	13.5 11 [illegible]	74	11 10 87	ssw	bc		1	" " "
	16	31.11 50 -29.4	31.05 46 -28.3	30.95 51 -25.5	7 6 85 9.5	86.5	10 9 86	s/E	bc	[illegible]	1	" " "
	17	30.48 50 -16.6	30.29 54 -14.4	30.18 58 -12.7	9 8 86 10	86	11 9 75	E	bc		1	" " "
	18	29.93 60 -14.4	29.80 58 -13.3	29.70 57 -13.3	12 10 76 13.5	82.5	12 10.5 82	E/n	bc		1	" " "
	19	29.67 60 -13.3	29.68 55.5 -13.8	29.80 56 -17.7	10.5 10 82 15	[illegible]	14.5 13 83	w/n	bc	1.884	1	" " "
	20	29.93 56 -16.1	30.00 55 -18.8	30.09 60 -18.3	13 11 77 15.5	74	12 10.5 82	nw/w	bc		1	" " "
73° 48' N 179° 48' E	21	30.25 61 -[illegible]	30.20 57 -18.0	30.25 59 -15.5	14 11.5 73.5 13.5	82.5	12 11 88	nE	bc		1	" " "
	22	30.23 55.5 -21.6	30.20 5[illegible] -23.3	30.20 58 -20.5	11 9 75 10.5	80.5	13 12 89	nnw	bc	[illegible]	1	" " "
	23	30.19 54 -23.3	30.17 53 -23.8	30.20 54 -23.3	11 9 75 10	74	13 11 77	nw/n	bc		1	" " "
	24	30.27 65 -22.7	30.30 56 -26.1	30.36 54 -24.4	14.5 12 73 12.5	71	11.5 10 82	sw	bc		1	"
	25	30.39 60 -21.6	30.33 56 -24.1	30.29 55 -23.3	11.5 10 82 10	74	11.5 10 82	E	bc		1	" " "
	26	30.14 53 -23.8	30.06 50 -21.6	30.05 57.5 -19.4	14 12 78 14.5	73	13 11.5 82.5	n	bc		1	" " "
	27	30.01 59 -19.4	29.97 55 -17.1	29.95 61 -17.1	16 14 79 14	75	14 12.5 73	nE	bc		1	" " "
73° [illegible] N [illegible] E	28	29.95 60 -18.3	29.94 49 -18.8	30.03 61.5 -20	15.5 13 74 14.5	78	12 10.5 82	n/E	bc		1	" " "
74° 0 N	29	30.24 60 -20	30.20 56 -20	30.00 57 -17.7	12.5 10 71 13	77	14 12 79	EnE	bc		1	" " "
	30	29.60 57 -6.6	29.58 63 -6.6	29.66 61 -6.1	14.5 12 73 14	79	14.5 15 84	sE/s	bc	3.0803	1	Spar deck wet [illegible] melting in deck house
	31											
Mean		30.10 52 -21.5	[illegible]	30.11 55 -21.7	12.7 10.6 [illegible]	[illegible]	[illegible] 79.1	[illegible]	bc	1.884 WR	1	[illegible]

Observations for carbonic acid should be made at least once a week, and the air of the berth deck at night or early in the morning should be selected. The results will not be entered unless the observer is certain of their accuracy.
The time and circumstances of observations for carbonic acid and the wetting of the decks *from any cause* will be entered in column of Remarks.
Same instruments to be used in all hygrometric observations.

For ascertaining the amount of carbonic acid in the air the following apparatus is supplied:

Two glass jars, cubic capacity marked in cubic centimeters.

India-rubber stoppers, and sheet india rubber to tie over necks of jars.

Glass measure graduated to 60 c. c.

One Mohr's burette, 50 c. c., graduated into tenths.

Glass rods.

Glass bottle of one liter capacity.

Bottle containing papers of crystallized oxalic acid of 2.25 grammes each.

Bottle containing litmus or turmeric paper.

A small bellows, or, in its absence, a David-son's syringe may be used.

Lime water and distilled water.

Directions: Pettenkofer's method is to be followed. For those not familiar with it the following process, extracted from Wilson's Hand-Book of Hygiene, is recommended:

The analysis depends on the relative alkalinity of lime water before and after it has absorbed the carbonic acid in the sample of air examined. 2.25 grammes of crystallized oxalic acid are dissolved in 1 liter of distilled water; 1 c. c. of this solution exactly neutralizes 1 milligramme of lime, and hence the amount of lime in a given quantity of lime water can be determined by adding the solution of oxalic acid until the point of neutralization is reached. The amount of oxalic acid required for neutralization expresses the alkalinity of the lime water. If the alkalinity of the lime water be known before and after it has absorbed the carbonic acid in the air contained in the glass jar, the difference will give the amount of lime in milligrammes which has united with the carbonic acid, and the amount of the latter is obtained by calculating according to the atomic weights.

The jar should be perfectly clean and dry. The air to be examined is forced into the jar by a pair of bellows, or a bellows-pump may be used. In either case the nozzle should reach the bottom of the jar.

After the jar has been filled, 60 c. c. of lime water are introduced, the mouth of the jar closed by the stopper, and the stopper secured by a tightly-fitting india-rubber cap. The jar is then well shaken so that the lime water is made to thoroughly wash the contained air, and afterward is left to stand at least eight hours and not more than twenty-four; 60 c. c. are introduced in order that 30 may be taken out for analysis.

Thirty cubic centimeters of lime are poured into the graduated glass and its alkalinity determined by the test solution. Then 30 c. c. are taken from the jar and the alkalinity also determined. The difference is doubled to account for the 30 c. c. left in the jar, and the product gives the amount of lime which has combined with the carbonic acid. The amount of the latter is obtained by converting weight into volume according to the atomic weights, and in one sum by the factor .39748+.

The following rule will simplify the calculation: Multiply the difference between the alkalinity of the lime water before and after it has been placed in the jar by 795 and divide this sum by the number of cubic centimeters in the jar, minus 60. The result will be the ratio of carbonic acid per 1,000 volumes.

A correction must be made for temperature as it is above or below the standard of 62° Fahrenheit. As the coefficient of expansion of air is .0020361 for every degree of Fahrenheit, the rule for correction may be stated with sufficient accuracy thus: For every 5° Fahrenheit above 62° add 1 per cent. to the amount of carbonic acid calculated as above, and deduct the same percentage for every 5° below 62°.

The formula for the correction for pressure is as follows:

30 : observed height of bar. : : capacity : z.

The result expressed by z is substituted for the actual capacity of the jar in the calculation for carbonic acid.

Atmospheric Observations on board U. S. S. Arctic Ship Jeannette, for the month of December, 1880.

AVERAGE NUMBER OF SHIP'S COMPANY. No. 33

Place	Date	Spar deck 10 A.M. Barometer	Attached Thermometer	Dry bulb	Spar deck 1 P.M. Barometer	Attached Thermometer	Dry bulb	Spar deck 10 P.M. Barometer	Attached Thermometer	Dry bulb	Berth deck 10 A.M. Dry bulb	Wet bulb	Relative humidity	Col. 4	Col. 5	Berth deck 10 P.M. Dry	Wet	Relative humidity	Wind	Weather	Carbonic acid	Wetting of decks	Remarks
	1	29.53	54	-8.3	29.55	59	-9.4	29.82	60	-17.7	16	13.5	74	15	[illegible]	15	13	78	ENE	bc		1	A deck wet melting in deck house
	2	29.88	53	-20.5	30.03	56.5	-23.3	30.10	57	-22.2	11	9	75	12	76	11	9.5	81	SW/S	bc		1	Dry.
	3	30.58	54	-25.5	30.20	61.5	-23.8	30.54	58	-20.	11.5	9	72	11	75	13	11.5	83.5	WSW	bc		1	dry.
	4	29.98	57	-10	29.90	53	-7.7	29.84	61.5	-8.6	12	10	76	14.5	88	13.5	12	83	S/E	oc		1	A. damp. B dry.
Lat 74° N Long 179° 10' E	5	29.84	57	-12.2	30.23	57	-17.2	30.44	63	-23.8	15	13	78	16	79	15	13	78	N x W	ocs	[illegible]	1	" " " "
Lat 73° 53' N Long 177° 10' E	6	30.52	58	-29.4	30.50	54	-28.8	30.48	60	-29.4	13	10.5	71.5	13	77	12	10	76	W/S	Bc	[illegible]	1	dry –
	7	30.26	55	-24.6	30.00	50	-23.3	29.95	61	[illegible]	12.5	10.5	76.5	13	77	13	11.5	93.5	S	Bc	2.2417	1	"
	8	29.80	56	-22.2	29.80	55	-21.1	29.88	61	-22.2	12.5	10	71	13.5	77.5	11	9	75	W/S	Bc		1	"
	9	29.81	53	-28.5	29.80	50	-28.	29.83	61	-27.7	12.5	10	71	12	76	11	9	75	W/S	Bc		1	"
	10	29.69	55	-24.4	29.62	52	-25.5	29.56	55	-23.8	11	9	75	9	86	8	6	85	"	Bc		1	"
	11	30.09	55	-28.3	30.19	52	-30.0	30.29	53	-31.6	12	10	70	10	74	8.5	7	79.5	WNW	Bc		1	"
	12	30.03	55	-28.3	30.05	52	-25.5	29.98	54	-23.8	9.5	7	67.5	11	75	9.5	9	93.5	SSW	Bc		1	"
	13	29.83	55	-23.3	29.75	54	-23.3	29.73	56	-23.8	13	11	77	15	73	13	11.5	83.5	S/W	oc		1	"
	14	29.70	50	-28.3	29.62	49	-30.	30.05	55	-32.7	10.5	9	81	11	75	13	12	88	WSW	bc		1	"
	15	30.37	52	-23.3	30.24	50	-34.4	30.38	55	-34.1	10	9	86	13.5	72	12.5	11	82	NNW	bc	B deck 10 p.m.	1	"
	16	30.24	57	-35.5	30.05	52	-33.3	29.96	56	-32.2	13.5	11	72	12	76	10.5	9.5	88.5	NW/N	bc		1	"
	17	29.75	53	-38.3	29.67	44.5	-34.4	29.65	53	-33.3	14.5	12	73	14	73.5	13	11	78	W	bc	2.683	1	"
	18	29.59	50	-28.3	29.62	49	-26.6	29.69	56	-21.6	8	6	72	11.5	81.5	12	10.5	82	S	bc		1	"
	19	29.68	54	-29.4	29.69	52	-30.0	29.78	57	-31.1	13	11	77	12.5	82	11.5	10	91.5	E/N	bc		1	"
	20	29.90	59	-31.6	29.85	53	-28.8	29.72	54	-25.5	11	9.5	81	14	83.5	14.5	13	83	ENE	bc		1	"
	21	29.77	58	-24.4	29.70	49	-24.4	29.72	55	-23.8	13.5	11.5	77	13	77	11	9.5	81	W/N	ocs		1	"
	22	29.75	52	-23.8	29.89	49.5	-25.5	30.06	52	-23.3	13	11	77	14	73.5	12.5	11	82	W	oc		1	"
	23	30.30	52	-26.6	30.30	48	-26.6	30.15	52	-26.1	11	9	77	14.5	83	12	11	88	NW/W	oc		1	"
	24	29.87	49	-21.1	29.90	47	-18.8	30.02	56	-17.7	14.5	12	70	12	88	11.5	10	81.5	N	oc		1	"
	25	29.75	57	-12.7	29.80	54	-15.5	29.60	55.5	-15.5	12.5	10	71	14.5	83	13	12	88	SSE	bc		1	"
	26	29.75	55	-15.0	29.55	53	-17.7	29.94	56	-23.8	15.5	13.5	77	16	84	15.2	14	87	W/N	oc		1	"
3 Lat 73° 37' N Long 179° 32' W	27	30.02	44	-28.3	30.06	52.5	-29.4	30.02	55	-29.4	15	13	78	16	79	15	13.5	82	S	bc	2.2292	1	"
	28	30.17	53	-31.1	30.20	52	-32.2	30.20	52	-32.2	13.5	11	72	15	78	13	11.5	83.5	S/E	bc		1	"
	29	30.14	50	-31.4	30.08	49	-26.6	30.05	55	-26.1	12	10	70	16	79	13	11	78		bc		1	"
	30	29.79	50	-21.6	29.50	50	-18.8	29.67	52.5	-22.2	11.5	9	72	11	77	11	9.5	81	E/N	bc		1	"
	31	30.73	56	-23.8	29.83	53	-29.1	29.97	52.5	-30.	15	13	78	14	78	12	10	78	WSW	bc		1	"
Average		[illegible]	53.7	[illegible]	29.93	53.3	-24.8	29.97	55.7	-24.4	12.2	10.7	74.5	15	[illegible]	[illegible]	10	82.1	[illegible]	bc	2.3913	1	dry.

Observations for carbonic acid should be made at least once a week, and the air of the berth deck at night or early in the morning should be selected. The results will not be entered unless the observer is certain of their accuracy.

The time and circumstances of observations for carbonic acid and the wetting of the decks *from any cause* will be entered in column of Remarks.

Same instruments to be used in all hygrometric observations.

For ascertaining the amount of carbonic acid in the air the following apparatus is supplied:

Two glass jars, cubic capacity marked in cubic centimeters.

India-rubber stoppers, and sheet india rubber to tie over necks of jars.

Glass measure graduated to 60 c. c.

One Mohr's burette, 60 c. c., graduated into tenths.

Glass rods.

Glass bottle of one liter capacity.

Bottle containing papers of crystallized oxalic acid of 2.25 grammes each.

Bottle containing litmus or turmeric paper.

A small bellows, or, in its absence, a Davidson's syringe may be used.

Lime water and distilled water.

Directions: Pettenkofer's method is to be followed. For those not familiar with it the following process, extracted from Wilson's Hand-Book of Hygiene, is recommended:

The analysis depends on the relative alkalinity of lime water before and after it has absorbed the carbonic acid in the sample of air examined. 2.25 grammes of crystallized oxalic acid are dissolved in 1 liter of distilled water; 1 c. c. of this solution exactly neutralizes 1 milligramme of lime, and hence the amount of lime in a given quantity of lime water can be determined by adding the solution of oxalic acid until the point of neutralization is reached. The amount of oxalic acid required for neutralization expresses the alkalinity of the lime water. If the alkalinity of the lime water be known before and after it has absorbed the carbonic acid in the air contained in the glass jar, the difference will give the amount of lime in milligrammes which has united with the carbonic acid, and the amount of the latter is obtained by calculating according to the atomic weights.

The jar should be perfectly clean and dry. The air to be examined is forced into the jar by a pair of bellows, or a bellows-pump may be used. In either case the nozzle should reach the bottom of the jar.

After the jar has been filled, 60 c. c. of lime water are introduced, the mouth of the jar closed by the stopper, and the stopper secured by a tightly-fitting india-rubber cap. The jar is then well shaken so that the lime water is made to thoroughly wash the contained air, and afterward is left to stand at least eight hours and not more than twenty-four; 60 c. c. are introduced in order that 30 may be taken out for analysis.

Thirty cubic centimeters of lime are poured into the graduated glass and its alkalinity determined by the test solution. Then 30 c. c. are taken from the jar and the alkalinity also determined. The difference is doubled to account for the 30 c. c. left in the jar, and the product gives the amount of lime which has combined with the carbonic acid. The amount of the latter is obtained by converting weight into volume according to the atomic weights, and in one sum by the factor .39748+.

The following rule will simplify the calculation: Multiply the difference between the alkalinity of the lime water before and after it has been placed in the jar by 795 and divide this sum by the number of cubic centimeters in the jar, minus 60. The result will be the ratio of carbonic acid per 1,000 volumes.

A correction must be made for temperature as it is above or below the standard of 62° Fahrenheit. As the coefficient of expansion of air is .0020361 for every degree of Fahrenheit, the rule for correction may be stated with sufficient accuracy thus: For every 5° Fahrenheit above 62° add 1 per cent. to the amount of carbonic acid calculated as above, and deduct the same percentage for every 5° below 62°.

The formula for the correction for pressure is as follows:

30 : observed height of bar. : : capacity : z.

The result expressed by z is substituted for the actual capacity of the jar in the calculation for carbonic acid.

Atmospheric Observations on board U. S. S *Arctic Str Jeannette*, for the month of *February*, 188*1*.

AVERAGE NUMBER OF SHIP'S COMPANY. No. *33*

Date	Spar deck 10 A.M. Barometer	Attached Thermometer	Dry bulb	Spar deck 4 P.M. Barometer	Attached Thermometer	Dry bulb	Spar deck 10 P.M. Barometer	Attached Thermometer	Dry bulb	Berth deck 10 A.M. Dry bulb	Wet bulb	Relative humidity	Berth deck 4 P.M. Dry bulb	Wet bulb	Relative humidity	Berth deck 10 P.M. Dry bulb	Wet bulb	Relative humidity	Wind	Weather	Carbonic acid		Remarks
1	30.54	56	-16.1	30.63	58	-18.3	30.69	62	-18.8	14.5	14	76	14	12	78	14.5	12.5	78	E	bc		1	dry.
2	30.58	58	-18.3	30.41	53	-18.3	30.26	57	-18.0	14.5	13.5	69.5	15.5	12	85	15	13.5	83.5	NE/E	bc		1	"
3	29.96	55	-14.4	29.82	54	-15.5	[illegible]	[illegible]	-15.0	15	13	78	14.5	14	[illegible]	16	14	79	NNE	ocs	2.49	1	"
4	29.64	55	-14.4	29.68	53	-15.5	29.80	51	-21.6	14	14	[illegible]	[illegible]	[illegible]	74	17	15	80	WNW	ocs		1	"
5	30.03	58	-30.5	30.03	54	-31.6	30.02	60	-29.4	16	13.5	73.5	15.5	13	74	18	11.5	80	"	bc		1	Washed 3 deck.
6	29.79	55	-25.5	29.75	55	-26.6	29.87	59	-31.1	15	13	78	13	11	72	11.5	10.5	87.2	ENE	bcg		1	Dry.
7	30.[illegible]5	56	-33.8	30.20	55	-33.3	30.27	57	-31.6	12	10	78	14.5	12	73	13.5	12	83	W	bc		1	"
8	30.16	56	-24.4	30.11	52	-21.6	30.15	56	-[illegible]	12	10	78	13	11	77	13.5	12	88	NE/E	bc		1	"
9	30.38	51	-18.3	30.48	52	-19.4	30.53	57	-21.1	14.5	12	73	[illegible]	12	[illegible]3	14.5	13	[illegible]8	[illegible]E	bc		1	"
10	30.45	56.5	-16.1	30.38	57	-13.3	30.37	61	-12.7	17	14.5	75	16	13	74	17	15.5	85	ENE	bc	2.758	1	"
11	30.54	58	-15.0	30.63	55	-14.4	30.64	61	-13.3	16.5	14	76	[illegible]5	13	78	15	13.5	83.5	NNE	bc		1	"
12	30.30	54	-13.8	30.30	53	-9.4	30.56	57	-12.2	17	13	78	[illegible]	13	[illegible]8	16	14	79	NE	bc		1	[illegible]
13	31.02	60	-17.2	31.05	58	-20.0	31.07	60	-19.4	14	14	79	14.5	12	73	14.5	12.5	78	NNW	bc		1	dry
14	30.90	57	-17.7	30.83	57	-17.2	30.74	59	[illegible]	14	11.5	72.5	14	12	78	15.5	13.5	79	E	bc		1	"
15	30.62	54	-17.7	30.60	53	-20.5	30.71	64	-21.1	17	14.5	75	15	12	78	14	12	78	SSW	bc		1	"
16	30.72	55	-21.1	30.70	50	-21.1	30.78	61	-21.6	15	12.5	73	13	11	7[illegible]	13	11	77	E/N	bc		1	"
17	30.84	54	-22.7	30.84	56	-23.3	30.85	61	-23.8	12	9.5	71.5	12	10	78	13	11	72	NNE	bc		1	"
18	30.81	59	-24.4	30.73	57	-25.0	30.73	62	-25.0	10.8	8.5	75	14	12	78	14.5	12.5	78	N	bc		1	"
19	30.64	57	-24.4	30.57	57	-25.0	30.53	62	-24.4	11	9	75	14	12	78	11	9.5	81	N	bc		1	Washed 3 deck.
20	30.25	54	-22.7	30.15	50	-23.8	30.14	58	-23.3	13	10.5	71.5	14.5	12	79	12	10	76	E/N	bc	1.5284	1	dry.
21	30.23	52	-23.3	30.29	52	-28.3	30.35	60	-28.3	10.5	8.5	75	13	11	77	10	8.5	80	WNW	bc		1	"
22	30.25	55	-29.4	30.39	50	-31.6	30.48	57	-32.2	10	8	74	7.5	[illegible]	80	10	9	86	ESE	bc		1	"
23	30.49	53	-31.6	30.45	51	-31.6	30.42	57	-30.5	12	10	76	11	9	75	13	12	88	NE	bc		1	"
24	30.24	53	-23.6	30.16	53.5	-19.4	30.19	58	-16.6	11	9	75	12.5	10	76.5	13.5	12	83	ENE	ocg		1	"
25	30.27	52	-18.3	30.32	53.5	-19.4	30.44	58	-21.1	14.5	12	76	12	10	83	15	13	78	E/N	ocg	1.2446	1	"
26	30.53	52	-21.1	30.60	49	-24.4	30.73	57	-26.6	12.5	10	71	13	11	77	13.5	12	83	E/N	bcg		1	Washed 3 deck.
27	30.73	53	-27.7	30.62	52	-27.7	30.57	56	-28.3	13	11	77	13	11	77	13.5	12	83	NNW	bc		1	
28	30.29	52	-26.1	30.33	51	-28.3	30.30	55	-27.2	14	13.5	73.5	14.5	13	78	14.5	15.5	89.5	NNW	bc		1	
29																							
30																							
31																							
Average	30.[illegible]6	55	-21.7	30.[illegible]	53.7	[illegible]	[illegible]	58	-22.4	13.9	11.6	74.8	15	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]			2.0808	1	Berth deck washed on [illegible].

Observations for carbonic acid should be made at least once a week, and the air of the berth deck at night or early in the [illegible] should be selected. The results will not be entered unless the observer is certain of their accuracy.
The time and circumstances of observations for carbonic acid and the wetting of the decks *from any cause* will be entered [illegible] of Remarks.
Same instruments to be used in all hygrometric observations.

For ascertaining the amount of carbonic acid in the air the following apparatus is supplied:

Two glass jars, cubic capacity marked in cubic centimeters.

India-rubber stoppers, and sheet india rubber to tie over necks of jars.

Glass measure graduated to 60 c. c.

One Mohr's burette, 60 c. c., graduated into tenths.

Glass rods.

Glass bottle of one liter capacity.

Bottle containing papers of crystallized oxalic acid of 2.25 grammes each.

Bottle containing litmus or turmeric paper.

A small bellows, or, in its absence, a Davidson's syringe may be used.

Lime water and distilled water.

Directions: Pettenkofer's method is to be followed. For those not familiar with it the following process, extracted from Wilson's Hand-Book of Hygiene, is recommended:

The analysis depends on the relative alkalinity of lime water before and after it has absorbed the carbonic acid in the sample of air examined. 2.25 grammes of crystallized oxalic acid are dissolved in 1 liter of distilled water; 1 c. c. of this solution exactly neutralizes 1 milligramme of lime, and hence the amount of lime in a given quantity of lime water can be determined by adding the solution of oxalic acid until the point of neutralization is reached. The amount of oxalic acid required for neutralization expresses the alkalinity of the lime water. If the alkalinity of the lime water be known before and after it has absorbed the carbonic acid in the air contained in the glass jar, the difference will give the amount of lime in milligrammes which has united with the carbonic acid, and the amount of the latter is obtained by calculating according to the atomic weights.

The jar should be perfectly clean and dry. The air to be examined is forced into the jar by a pair of bellows, or a bellows-pump may be used. In either case the nozzle should reach the bottom of the jar.

After the jar has been filled, 60 c. c. of lime water are introduced, the mouth of the jar closed by the stopper, and the stopper secured by a tightly-fitting india-rubber cap. The jar is then well shaken so that the lime water is made to thoroughly wash the contained air, and afterward is left to stand at least eight hours and not more than twenty-four; 60 c. c. are introduced in order that 30 may be taken out for analysis.

Thirty cubic centimeters of lime are poured into the graduated glass and its alkalinity determined by the test solution. Then 30 c. c. are taken from the jar and the alkalinity also determined. The difference is doubled to account for the 30 c. c. left in the jar, and the product gives the amount of lime which has combined with the carbonic acid. The amount of the latter is obtained by converting weight into volume according to the atomic weights, and in one sum by the factor .39748+.

The following rule will simplify the calculation: Multiply the difference between the alkalinity of the lime water before and after it has been placed in the jar by 795 and divide this sum by the number of cubic centimeters in the jar, minus 60. The result will be the ratio of carbonic acid per 1,000 volumes.

A correction must be made for temperature as it is above or below the standard of 62° Fahrenheit. As the coefficient of expansion of air is .0020361 for every degree of Fahrenheit, the rule for correction may be stated with sufficient accuracy thus: For every 5° Fahrenheit above 62° add 1 per cent. to the amount of carbonic acid calculated as above, and deduct the same percentage for every 5° below 62°.

The formula for the correction for pressure is as follows:

30 : observed height of bar. : : capacity : z.

The result expressed by z is substituted for the actual capacity of the jar in the calculation for carbonic acid.

Atmospheric Observations on board U. S. S. *Arctic Str Jeannette*, for the month of *January*, 18*81*.

Place	Date	Spar Deck 10 A.M. Bar.	Att. Th.	Dry	Spar Deck 1 P.M. Bar.	Att. Th.	Dry	Spar Deck 10 P.M. Bar.	Att. Th.	Dry	Berth Deck 10 A.M. Dry	Wet	Rel. Hum.	Berth Deck 1 P.M. Dry	Wet	Rel. Hum.	Berth Deck 10 P.M. Dry	Wet	Rel. Hum.	Wind	Weather	Carbonic acid		Remarks
	1	30.00	59	-24.1	29.95	55	-24.1	29.97	59	-25.5	14	12	78	15.5	13	78/79	14	12	78	NE/E	bc		1	Dry.
	2	29.94	49	-24.4	29.97	49	-24.4	30.00	55	-23.8	12.5	11	82	14	12	78	12.5	11	82	ENE	bc		1	"
	3	30.03	53	-24.4	30.02	51	-23.3	30.10	52	-21.6	10.5	8.5	75	12.	9	65	12.5	11	82	ENE	bc		1	"
	4	30.28	50	-21.6	30.32	51	-22.7	30.39	53	-22.7	13	11	77	11.5	10	81.5	10.5	9.5	87	S/N	bc	1.5953	1	"
	5	30.33	55	-24.1	30.28	52	-23.8	30.24	57	-23.8	11.5	10	81.5	14.5	12	73	12.5	11	82	ENE	bc			"
	6	30.14	54	-24.4	30.09	52	-21.6	30.09	54	-21.1	14	12	78	13	11	77	12	11	88	N/W	bc		1	"
	7	29.95	56	-16.1	29.98	58	-14.4	29.96	60	-14.4	15.5	13.5	79	14	12	78	13	12	88	ENE	oc/		1	"
	8	29.99	[illegible]	-18.3	30.12	59	-17.7	30.28	58	-17.2	12	10	76	13	11	77	13.5	12.5	88.5	WNW	bc		1	"
	9	30.46	55	-23.6	30.53	53.5	-27.2	30.53	58.5	-28.3	16	14	79	14	12	77	11.5	10.5	87.5	NE/N	bc		1	"
	10	30.31	57	-21.5	30.20	55	-19.4	30.10	58	-16.1	14	12.5	83/85	13.5	12/13	85	13	12	88	ENE	ocz		1	"
	11	30.05	58	-11.4	30.05	57	-14.4	30.10	59.5	-19.1	15.5	13.5	79	14.5	12	73	12	11	88	NE/E	oc	2.4059	1	"
	12	30.05	54.5	-18.3	30.05	58	-15.5	29.98	56	-13.5	13.5	12	83	13.5	12	83	12.5	11	82	ENE	oc		1	"
	13	29.95	52	-15.5	30.00	54	-17.2	30.03	59	-14.4	16	14	79	15	13	78	15	14	89	WNW	oc		1	"
	14	30.05	56	-15.5	30.05	53	-15.5	30.10	52.5	-18.8	15.5	13.5	79	14.5	13	83	13	12	88	NW/W	ocz		1	"
	15	30.18	54	-24.4	30.20	50	-29.4	30.23	53	-31.6	16.5	15	85	14.5	13	88	13.5	12	83	NE/N	bc		1	Washed [illegible] deck
	16	30.14	53	-32.7	30.20	50.5	-24.1	29.98	54	-23.8	15.5	13	74	15.5	14	86	14	12	78	W	bc		1	dry.
	17	29.79	53	-23.8	29.72	53	-23.3	29.95	53	-21.6	14.5	12.5	79	14	12	78	14.5	12.5	79	NW/W	oc	1.450	1	"
	18	29.60	51	-21.6	29.60	48	-23.8	29.69	54.5	-24.4	14.5	12	73	12.5	10	71	11	10	87	W/S	oc		1	"
	19	29.84	51	-26.6	29.90	49	-23.8	29.99	53	-28.8	15	12.5	73	15.5	13.5	79	14.5	12	73	SE	oc		1	"
	20	30.00	51	-32.2	29.99	51	-32.7	30.03	57	-33.3	14	13	78	16.5	14.5	79	13	11	77	SXE	bc		1	"
	21	30.04	51	-31.1	30.15	50	-32.2	30.22	56.5	-32.2	15.5	13	79/84	15	13	78	12.5	11.5	89/87	WNW	bc		1	"
	22	30.40	52	-31.1	30.45	51	-30.0	30.53	53	-33.3	12.5	10.5	76.5	13	11	77	11	10	87	S/E	ocz		1	washed the deck.
	23	30.75	53	-35.5	30.87	56	-36.1	30.05	52.3	-35.5	13.5	11.5	77.5	12.5	11	82	12	11	88	SW/S	bc		1	dry.
	24	31.19	53	-35.8	31.10	50	-35.5	31.03	45	-34.4	11	10	87	13	11	88	11	10	87	SE/S	bc		1	"
	25	30.69	53	-29.8	30.42	47	-24.4	30.30	52	-20.5	10.5	9	81	10.5	9	81	10	9	86	ENE	oc		1	"
	26	30.10	55	-16.6	30.01	52	-15.5	30.07	59	-15.0	13.5	11	72	13.5	12	83	17.5	15	75	ENE	bc		1	"
	27	30.25	56	-16.1	30.42	55	-22.7	30.53	58	-25.0	15.5	13	79	16	14.5	84	17.5	15.5	80	SW/W	bc		1	"
	28	30.32	55	-18.3	30.37	53.5	-18.3	30.54	57	-22.2	17	15	80	17.5	15	75	15	13	78	E	ocz		1	"
	29	30.65	55	-26.1	30.63	55.5	-24.4	30.59	60	-23.3	17	14	70	18	15.5	75.5	15.5	13	79	N	bc		1	Washed the deck
	30	30.35	50	-20.0	30.26	56	-18.8	30.22	57	-17.7	19	16	72	15.5	14	84	14	12.5	83.5	ENE	oc		1	
	31	30.16	57	-15.2	30.23	55	-15.0	30.35	57	-14.4	17	15	80	16	13.5	74	12.5	11	82	E	oc		1	
Average		30.19	54.1	-23	30.23	55.4	-26	30.19	53.9	-23.1	14.6	12.7	78.5	14.5	12.5	78.4	13.1	11.9	83.4	16 ENE	bc 17 oc 14		1	washed on saturday;

Observations for carbonic acid should be made at least once a week, and the air of the berth deck at night or early in the morning should be selected. The results will not be entered unless the observer is certain of their accuracy.
The time and circumstances of observations for carbonic acid and the wetting of the decks *from any cause* will be entered in column of Remarks.
Same instruments to be used in all hygrometric observations.

Surgeon, U. S. N.

For ascertaining the amount of carbonic acid in the air the following apparatus is supplied:

Two glass jars, cubic capacity marked in cubic centimeters.

India-rubber stoppers, and sheet india rubber to tie over necks of jars.

Glass measure graduated to 60 c. c.

One Mohr's burette, 60 c. c., graduated into tenths.

Glass rods.

Glass bottle of one liter capacity.

Bottle containing papers of crystallized oxalic acid of 2.25 grammes each.

Bottle containing litmus or turmeric paper.

A small bellows, or, in its absence, a Davidson's syringe may be used.

Lime water and distilled water.

Directions: Pettenkofer's method is to be followed. For those not familiar with it the following process, extracted from Wilson's Hand-Book of Hygiene, is recommended:

The analysis depends on the relative alkalinity of lime water before and after it has absorbed the carbonic acid in the sample of air examined. 2.25 grammes of crystallized oxalic acid are dissolved in 1 liter of distilled water; 1 c. c. of this solution exactly neutralizes 1 milligramme of lime, and hence the amount of lime in a given quantity of lime water can be determined by adding the solution of oxalic acid until the point of neutralization is reached. The amount of oxalic acid required for neutralization expresses the alkalinity of the lime water. If the alkalinity of the lime water be known before and after it has absorbed the carbonic acid in the air contained in the glass jar, the difference will give the amount of lime in milligrammes which has united with the carbonic acid, and the amount of the latter is obtained by calculating according to the atomic weights.

The jar should be perfectly clean and dry. The air to be examined is forced into the jar by a pair of bellows, or a bellows-pump may be used. In either case the nozzle should reach the bottom of the jar.

After the jar has been filled, 60 c. c. of lime water are introduced, the mouth of the jar closed by the stopper, and the stopper secured by a tightly-fitting india-rubber cap. The jar is then well shaken so that the lime water is made to thoroughly wash the contained air, and afterward is left to stand at least eight hours and not more than twenty-four; 60 c. c. are introduced in order that 30 may be taken out for analysis.

Thirty cubic centimeters of lime are poured into the graduated glass and its alkalinity determined by the test solution. Then 30 c. c. are taken from the jar and the alkalinity also determined. The difference is doubled to account for the 30 c. c. left in the jar, and the product gives the amount of lime which has combined with the carbonic acid. The amount of the latter is obtained by converting weight into volume according to the atomic weights, and in one sum by the factor .39748+.

The following rule will simplify the calculation: Multiply the difference between the alkalinity of the lime water before and after it has been placed in the jar by 795 and divide this sum by the number of cubic centimeters in the jar, minus 60. The result will be the ratio of carbonic acid per 1,000 volumes.

A correction must be made for temperature as it is above or below the standard of 62° Fahrenheit. As the coefficient of expansion of air is .0020361 for every degree of Fahrenheit, the rule for correction may be stated with sufficient accuracy thus: For every 5° Fahrenheit above 62° add 1 per cent. to the amount of carbonic acid calculated as above, and deduct the same percentage for every 5° below 62°.

The formula for the correction for pressure is as follows:

30 : observed height of bar. : : capacity : z.

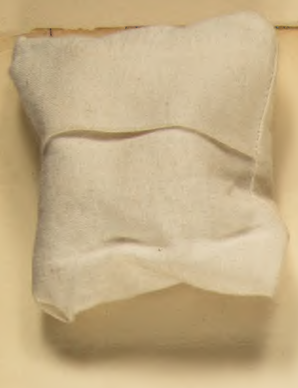
The result expressed by z is substituted for the actual capacity of the jar in the calculation for carbonic acid.

Atmospheric Observations on board U.S.S *Arctic Str Jeannette*, for the month of *March*, 188*1*.

Place	Date	Spar deck 10 A.M. Barometer	10 A.M. Attached Thermometer	10 A.M. Dry bulb	10 A.M. Wet bulb	10 A.M. Relative humidity	4 P.M. Barometer	4 P.M. Attached Thermometer	4 P.M. Dry bulb	4 P.M. Wet bulb	4 P.M. Relative humidity	10 P.M. Barometer	10 P.M. Attached Thermometer	10 P.M. Dry bulb	10 P.M. Wet bulb	10 P.M. Relative humidity	Berth deck 10 A.M. Dry bulb	10 A.M. Wet bulb	10 A.M. Relative humidity	4 P.M. Dry bulb	4 P.M. Wet bulb	4 P.M. Relative humidity	10 P.M. Dry bulb	10 P.M. Wet bulb	10 P.M. Relative humidity	Wind	Weather	Carbonic acid corrected for Temp. and Pressure, per 1,000 volumes	Number of sick, excluding injuries	Remarks
	1	29.97	52	-22.2			29.93	49.5	-21.6			29.97	57	-21.6			13.5	12.5	88.5	~~16~~ 16.5	13.5	69.5	15.5	14	84	nw	oc		1	
	2	30.06	54	-22.2			30.12	50	-22.7			30.21	55	-22.2			16.5	14	74	17	14	70	16	14	79	nw	bc		1	
	3	30.27	50	-26.1			30.21	51	-26.6			30.29	59	-28.3			15.5	13	74	16.5	14	74	16	14	79	nnw	bc		1	
	4	30.31	56	-29.1			30.29	54	-29.1			30.32	61	-30.5			18	15	71	15.5	12	64	17	15.5	85	nnw	oc	4.8474	1	Doors in [illegible] had been closed up to 10 p.m.
	5	30.27	55	-31.9			30.28	48.5	-30.5			30.25	57	-32.7			14	11.5	70	13	11	77	14	11	67	nnw	bc		1	Berth deck washed up.
	6	30.22	49	-32.7			30.25	50	-31.6			30.30	59	-34.4			13	11	77	12.5	10.5	76.5	13	11	77	w	bc		1	
	7	30.30	57.5	-34.4			30.22	52	-30.3			30.25	57	-33.8			18	15	71	15	12	68	10	8.5	80	wsw	bc		1	
	8	29.83	56	-27.2			29.59	52	-25.5			29.46	53	-24.4			13.5	11	72	13.5	10.5	64.5	13	10	66	sw	ocg		1	
	9	29.62	49	-29.4			29.72	47	-31.1			29.83	57	-34.4			11	10	87	13	10	46	13	11	77	wsw	bc		1	
	10	29.85	53	-35.0			29.73	48.5	-28.8			29.43	53	-24.4			15.5	12	63	16	12.5	64	15	13	78	sw/s	bc		1	
	11	29.65	53	-26.6			29.80	51	-28.3			29.97	60	-31.1			17.5	15	75	15	12	68	12	10	76	w	bc	1.5408	1	CO_2 Taken at 10 p.m. Berth deck.
	12	30.09	54	-34.4			30.09	48	-32.2			30.09	55.5	-33.8			15.5	13	74	15	12	68	12	10	76	wsw	bc		1	
	13	29.92	47	-27.7			29.89	49	-25.0			29.85	55	-23.8			17.5	14.5	70.5	16.5	13.5	70	18	15	71	sE/s	oc		1	
	14	29.50	52	-27.2			30.12	49	-27.7			30.32	57	-32.2			17	14	70	15.5	12.5	68.5	12.5	10.5	76.5	sw	bc		1	
	15	30.52	50	-33.8			31.45	52	-32.2			30.43	57.5	-33.6			15	13	78	16	13.5	75	17.5	9.5	75.7	sE	bc		1	
	16	30.28	55	-32.7			30.18	50	-30.0			30.13	53	-29.4			15	12	68	16	13	69	14	12	68	sE	bc		1	
	17	30.06	54	-25.5			30.06	49	-26.1			30.12	53	-28.8			15	12	68	17	14	70	14.5	12.5	78	s/E	ocs		1	
	18	30.07	53	-27.7			30.00	50	-23.8			29.97	49	-26.1			15.5	13	74	14.5	11.5	67.5	10	9	87	EsE	bc	1.9266	1	
	19	29.95	58	-25.0			29.95	54	-23.3			30.00	59	-25.0			15.5	13	74	15.5	13	74	14	12	68	EsE	bc		1	Berth deck washed up.
	20	30.15	56	-22.7			30.22	52	-21.6			30.30	59	-25.2			13	10	66	16	13	69	13.5	10.5	66.5	sE	bc		1	
	21	30.31	53	~~-25.7~~ 25.2			30.28	55	25.2 -26.2			30.33	57	~~-30.4~~ 30.0			~~13.5~~ 11	9	70	12.5	10	71	10.5	8.5	~~78~~	EsE	~~oc~~ bc		1	
	22	30.35	55	-30.5			30.35	51	-28.3			30.49	57	-30.0			14.5	11.5	67.5	14	11	67	11.5	9.5	75.7	E	bc		1	
	23	30.39	55	-29.4			30.27	52	-27.7			30.23	57	-29.4			13.5	10.5	66.5	15.5	12	68	13.5	11	72	EnE	bc		1	
	24	30.06	52	27.7			30.00	51	-26.6			30.00	53	-27.7			13	10	66	12	9	65	9	7	73	EnE	bc		1	
	25	30.00	55	-25.0			30.00	53	-24.4			30.08	58	-27.7			10	8	94	12	9.5	75.5	12.5	9.5	65.5	EnE	bc		1	
	26	29.99	45	-27.7			29.90	42	-21.6			29.85	57	-17.5			13	11	77	12	10	76	11.5	10.5	81.5	EnE	bcz		1	
	27	29.86	56	-12.2			29.89	56	-17.2			30.10	63	-26.1			15.5	13.5	79	14	11	67	13	11.5	82.5	EsE	ocs		1	
	28	30.30	57	-23.8			30.38	58	-21.6			30.48	57	-23.8			14	13	89	13.5	11	72	12	10.5	82	S	bc		1	
	29	30.34	52	-21.6			30.23	52	-18.3			30.18	58	-20.0			13	11	77	14.5	12	73	10	8	74	nE/E	bc		1	
	30	30.20	63	-18.3			30.20	63	-19.4			30.25	58	-23.3			15	12.5	73	15.5	14	74	13	11	77	E	bc		1	
	31	30.28	56	-24.4			30.29	64	-22.2			30.35	57	-26.1			12	10	76	14	12	79	12	10	76	EnE	bc		1	
Average		30.19	53.3	-27.1			30.12	51	-25.9			30.12	56.5	-27.6			14.8	12	73	14.4	11.9	70.5	12.9	11	79	v	bc 25, oc 4, ocs 2	2.7714	1	Berth deck washed up on certain days

Observations for carbonic acid should be made at least once a week, and the air of the berth deck at night or early in the morning should be selected. The results will not be entered unless the observer is certain of their accuracy.
The time and circumstances of observations for carbonic acid and the wetting of the decks *from any cause* will be entered in column of Remarks.
Same instruments to be used in all hygrometric observations.

Surgeon, U. S. N.



For ascertaining the amount of carbonic acid in the air the following apparatus is supplied:

Two glass jars, cubic capacity marked in cubic centimeters.

India-rubber stoppers, and sheet india rubber to tie over necks of jars.

Glass measure graduated to 60 c. c.

One Mohr's burette, 60 c. c., graduated into tenths.

Glass rods.

Glass bottle of one liter capacity.

Bottle containing papers of crystallized oxalic acid of 2.25 grammes each.

Bottle containing litmus or turmeric paper.

A small bellows, or, in its absence, a Davidson's syringe may be used.

Lime water and distilled water.

Directions: Pettenkofer's method is to be followed. For those not familiar with it the following process, extracted from Wilson's Hand-Book of Hygiene, is recommended:

The analysis depends on the relative alkalinity of lime water before and after it has absorbed the carbonic acid in the sample of air examined. 2.25 grammes of crystallized oxalic acid are dissolved in 1 liter of distilled water; 1 c. c. of this solution exactly neutralizes 1 milligramme of lime, and hence the amount of lime in a given quantity of lime water can be determined by adding the solution of oxalic acid until the point of neutralization is reached. The amount of oxalic acid required for neutralization expresses the alkalinity of the lime water. If the alkalinity of the lime water be known before and after it has absorbed the carbonic acid in the air contained in the glass jar, the difference will give the amount of lime in milligrammes which has united with the carbonic acid, and the amount of the latter is obtained by calculating according to the atomic weights.

The jar should be perfectly clean and dry. The air to be examined is forced into the jar by a pair of bellows, or a bellows-pump may be used. In either case the nozzle should reach the bottom of the jar.

After the jar has been filled, 60 c. c. of lime water are introduced, the mouth of the jar closed by the stopper, and the stopper secured by a tightly-fitting india-rubber cap. The jar is then well shaken so that the lime water is made to thoroughly wash the contained air, and afterward is left to stand at least eight hours and not more than twenty-four; 60 c. c. are introduced in order that 30 may be taken out for analysis.

Thirty cubic centimeters of lime are poured into the graduated glass and its alkalinity determined by the test solution. Then 30 c. c. are taken from the jar and the alkalinity also determined. The difference is doubled to account for the 30 c. c. left in the jar, and the product gives the amount of lime which has combined with the carbonic acid. The amount of the latter is obtained by converting weight into volume according to the atomic weights, and in one sum by the factor .39748+.

The following rule will simplify the calculation: Multiply the difference between the alkalinity of the lime water before and after it has been placed in the jar by 795 and divide this sum by the number of cubic centimeters in the jar, minus 60. The result will be the ratio of carbonic acid per 1,000 volumes.

A correction must be made for temperature as it is above or below the standard of 62° Fahrenheit. As the coefficient of expansion of air is .0020361 for every degree of Fahrenheit, the rule for correction may be stated with sufficient accuracy thus: For every 5° Fahrenheit above 62° add 1 per cent. to the amount of carbonic acid calculated as above, and deduct the same percentage for every 5° below 62°.

The formula for the correction for pressure is as follows:

30 : observed height of bar. : : capacity : z.

The result expressed by z is substituted for the actual capacity of the jar in the calculation for carbonic acid.

March 1881

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Atmospheric Observations on board U. S. S. , for the month of , 18 .

Place.	Date.	Spar deck 10 A. M. Barometer.	Attached Thermometer.	Dry bulb.	Wet bulb.	Relative humidity.	Spar deck 4 P. M. Barometer.	Attached Thermometer.	Dry bulb.	Wet bulb.	Relative humidity.	Spar deck 10 P. M. Barometer.	Attached Thermometer.	Dry bulb.	Wet bulb.	Relative humidity.	Berth deck 10 A. M. Dry bulb.	Wet bulb.	Relative humidity.	Berth deck 4 P. M. Dry bulb.	Relative humidity.	Berth deck 10 P. M. Dry bulb.	Wet bulb.	Relative humidity.	Wind.	Weather.	Carbonic acid corrected for Temp. and Pressure, per 1,000 volumes.	Number of sick, excluding injuries.	Remarks.
	1																												
	1879 Sept	29.80	38.4	-2.1			29.87	41.2	-2.9			29.86	30.6	-4.1			12.8	10.4	72.4	13.7	10	13.9	11.6	73.1		oc 16 bc 14.52	2.6206	0	Spar deck wet from melting snow + ice
	Oct	29.66	32	-11.1			29.65	32	-11.4			29.68	32	-11.5			11.8	9.5	71.3	10.1	70.3	14.3	11.6	69.5		oc 16 bc 7 s 8	1.47	0	
	Nov	29.70	32	-19.9			29.73	32	-17.2			29.75	32	-17.2			14.4	12.1	74	14.3	12 74.7	15.6	13.3	75.6	N	s 1 bc 5 oc 24	1.711	0	
	Dec	30.11	32	-23.6			29.98	32	-23.3			29.97	32	-23.5			14.1	12.5	83.5	14.1	13 4.8	15.3	13.7	83.6		bc 17 oc 14	2.5182 0.975c	0.2	Distilling in Deck house, damps.
	1880 Jan	30.32	32	-33.7			+30.23	32	-33.7			30.31	32	-34.6			15.6	14.1	82.1	15.2	133	15.8	14	81		bc 24 bz 3 4	2.854	1	" " " " "
	Feb	29.97	32	-38.8			29.92	32	-38.7			29.85	32	-38.9			11.6	10.8	89.8	12.1	11 6.3	13	12	88		bc 19 bc 5	(3) 5.304	1	" " " " "
	Mch	30.03	32	-28.1			30.01	32	-27.7			30.04	32	-31.4			15.3	14	86	15.4	1 84.7	15.8	14.5	86		bc 26 oc 4 s 7	2.349	1	" " " " "
	Apr	29.80	32	-13.9			-29.79	32	-12.1			29.83	32	-16.2			11.2	10.4	85.9	15.8	14 84.3	16.7	14.2	80.7		bc 14 oc 14	.45	1	" " " " "
	May	29.97	32	-8.4			·29.98	32	-7.7			30.20	32	-10.6			9.9	8.9	83	10.6	12 84.3	13.6	12	92	A	bc 12 oc 19	1.561	1	Decks washed up twice a week.
	June	29.78	35.6	+.25	+.03	90	29.78	39.5	+2.4	1.8	88	29.78	32.8	-.5	-.8	92.5	8.7	8.1	92.2	10.2	9.4	11.6	11.1	93.3	W	oc 15 bc 15	2.4213	1	17 days dry. 13 wet melting snow + Rain
	July	29.65	37.4	2	1.5	92.8	29.64	40.1	4.5	3.4	80.9	29.63	35	1	0.7	90.1	8.9	8.5	94.1	9.6	9.93	11.7	11.2	94.3	A	bc 13 oc 18	2.637	1	R 5. decks washed 5. S. 6. (1 [illegible])
	Aug	29.79	38	1.3	1.1	95.5	29.84	37.4	1.6	1.4	94	29.84	34.3	0.3	0.06	98	8.6	8.2	97.2	10.9	10.96	11.6	11.2	94.5	N	oc 28 bc 3	1.4756	1	R 5 " " 4 " 6
	Sept	29.76	49.6	-4.7			29.80	48.7	-4.6			29.82	51.5	-6.4			8.4	7.7	90.4	11.4	13 88.9	12.5	11.4	91.2		oc 19 bc 11	2.579	1	R. 1. " " 2 " 8. R+S 2.
	Oct	30.23	51.2	-15			30.22	50	-14.5			30.24	53.7	-15.3			7.7	5.9	78.7	11.7	10 82	11.9	10.2	79	W	oc 15 bc 16	1.9921	1	" " 2 " 6
	Nov	30.10	52	-21.8			30.06	50.9	-21.9			30.07	55	-21.7			12.7	10.6	76.5	12.2	10 77.1	12.5	10.8	79.1	N	oc 6 bc 24	1.8049 1.8840	1	Berth deck washed 1. a week, 2
	Dec	29.97	53.7	-24.7			24.93	53.3	-24.6			29.97	55.7	-24.4			12.2	10.7	74.5	13.2	11 74.5	12.1	10	82.1		oc 8 bc 23	2.3913	1	" " " 1 " " R. 2.
	Jan 1881	30.19	54.1	-23			30.23	55.4	-26			30.19	53.9	-23.1			14.6	12.7	78.5	14.5	12 78.4	13.1	11.9	83.4		oc 14 bc 17	1.8170	1	" " " 1 " "
	Feb 19	30.01	55	-21.7			30.38	53.7	-25.4			30.38	58	-22.4			13.9	11.6	74.9	13.9	11 76.8	13.8	12.2	81.3		oc 9 2 oc 2 bc 24	2.0803	1	" " " 1 " "
	Mch 20	30.09	53.5	-27.1			30.12	51	-25.9			30.12	56.5	-27.6			14.5	12	73	14.6	11.9 70.5	12.9	11	79	V	bc 25 oc 4 ocn 2	2.7214	1	
	Apr	30.15	53	17			30.00	51	-16			30.18	54.8	-16.8			7.1	6.1	79.2	10.3	8.6 78.8	9.9	8.7	80	V	bc 18 oc 8 oc 4	1.2058	1	
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Average																													

Average number of ship's company. No.

Observations for carbonic acid should be made at least once a week, and the air of the berth deck at night or early in the morning should be selected. The results will not be entered unless the observer is certain of their accuracy. The time and circumstances of observations for carbonic acid and the wetting of the decks *from any cause* will be entered in column of Remarks. Same instruments to be used in all hygrometric observations.

Surgeon, U. S. N.